Kintsukuroi

‘Natural Lighting, Tectonics and Materiality.’

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I would like to thank Kerry Francis, and all the tutors for keeping me on the straight and narrow throughout the project. Secondly, I would like to thank my family for the support and time they have spent helping me along the way. And lastly to my friends and peers, thanks for putting up with me, helping me maintain my sanity and for the occasional shoulder to cry on.
Abstract:

This project is an investigation of Japanese architectural characteristics and the ability to adapt them to the New Zealand context. The characteristics have been chosen due to their universal applications. They, in some degree, appear in all architectural projects. The three characteristics selected are natural lighting, tectonics and materiality.

The project focuses on the investigation of the Japanese architecture in relation to the three selected characteristics, and the concepts and origins which lead to the development of the architectural applications. Understanding the origins and intent of specific Japanese design characteristics, it is possible to successfully adapt them into another culture for the enrichment of architectural design.

The project uses the design of a ceramics museum as a way to demonstrate one possible architectural outcome using the characteristics found in Japanese architecture in New Zealand. The use of various design iterations are used to gain an understanding of the architectural applications of the Japanese characteristics. The design of the ceramics museum is used to develop adaptive techniques of the Japanese characteristics which relate to a New Zealand site.
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Fig 1: Abstract Kyoto Painting.
Kintsukuroi

“To Repair with Gold”

The art of repairing pottery with gold or silver lacquer and understanding that the piece is more beautiful for having been broken.¹

The title is derived from the development of the project. The project outcome is the design of a ceramics museum located in an earthquake prone area. This emphasises the fragility of both the ceramics and the site, and the faults which can appear. The project focuses on connection between two cultures, the site and programme. It explores the joining of structure and the selected characteristics.

1.0: Introduction

“Research Project.”
Background of the project:

In 2011 Christchurch was hit by a devastating earthquake which affected most of Canterbury. Most of the Christchurch CBD and heritage architecture was destroyed, giving Christchurch an opportunity to re-shape its image. Rather than replacing or repairing the buildings that were once there, Christchurch took this opportunity to be creative in shaping the city, creating a contemporary city which will change the way people view, and live in, Christchurch. An example of this is the introduction of the precinct in the CBD, a new innovative approach to urban design in New Zealand.

As a creative response to the Christchurch earthquake, the Cardboard Cathedral was one of the first semi-permanent or “transitional” architectural examples. Tom Daniell states; “The Cardboard Cathedral is an optimistic symbol for Christchurch’s traumatised citizens and an international statement of the city’s ongoing vitality”. Design Shigeru Ban is a world famous Japanese architect, well known for his innovative use of materials such as paper and cardboard. Shigeru Ban adapted Japanese architectural culture to New Zealand, creating a new innovative and symbolic architectural form which can be used as a guide to further develop New Zealand architecture through the continued adoption of other cultures.

Ban is famous for his temporary, disaster relief, projects which are constructed of paper tubes. There has been very little criticism of the cardboard Cathedral except that Bans signature cardboard structure is used for decoration, covering a timber A-frame. In this sense, it seems that Ban is trying to adapt the same construction techniques from Japan to New Zealand, which in a way failed, resulting in the need to use it as decoration to hide the timber structure. This raises the question, if this concept could not be adapted into another culture then what characteristics of Japanese architecture can be adapted in other cultures?

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3: Ibid., 106.
Project Outline:
The project is a case study demonstrating selected Japanese characteristics and how they can be used to enrich architectural design. The project involves the design of a museum, a programme to demonstrate specific architectural characteristics from Japanese culture and how these can be used to augment architecture in this country.

Aims/Objectives:
The project is an exploration of selected characteristics of Japanese architecture. The importance of these are explored in terms of architectural expression, how they differ from, and could perhaps be used in the enhancement of, New Zealand architectural design. It aims to demonstrate some Japanese approaches to design.

The purpose is to use these selected architectural characteristics, and apply them in a project in another culture. The project acts as a case study, demonstrating how these principles can be used to develop new and enriched ideas.

New Zealand can leverage the opportunities presented by an increasingly diverse, multi-cultural society. New Zealand architecture is no longer restricted to the dominant western architectural ideals. New Zealand architects are now able to adopt other cultural ideals to create New Zealand's own architectural language.

"New Zealand must have its own architecture, its own sense of what is beautiful and appropriate to our climate and conditions." – Group Architects.

Research Question:

How can the study of Japanese architecture be used to develop new concepts and enrich architectural design in Aotearoa, New Zealand?
Fig 3: Traditional Japanese House
Scope and Limitations:

One cannot simply transfer architectural principles from one culture/environment to another. Japanese architectural development and style are unique to their climate and cultural ideals, and are quite different to those of New Zealand. Not all principles that are found in Japanese architecture are suitable to be used to develop new ideas outside the Japanese culture. New Zealand culture is far too different, and therefore, this project is an exploration of selected characteristics found in Japanese architecture, which could be translated into the New Zealand context.

For this to be a manageable project, which can be completed in the defined time frame, it has been limited to a selection of three principles found in Japanese architecture. The principles chosen for the research and final design outcome are; the use of light and shadow through natural lighting, tectonic expression of the built form and the use of materials focusing on materiality and spatial definition.

Natural Lighting was selected due to its ubiquitous qualities. Natural light is everywhere within architecture, but there are specific techniques unique to Japanese architecture. New Zealand and Japanese architecture have a similar material palette, specifically the use of timber. Tectonics is a universal concept which describes the importance of structural expression. Japanese architecture is well known for its unique uses of timber and other materials. Timber construction and joinery is a unique quality in Japanese architecture, and how they express these qualities in their design. All characteristics have been selected due to their universal applications. The project focuses on the Japanese applications of the selected characteristics and how they can be adapted in another culture.

The project design outcome acts as a case study to show the possibilities of architectural design development resulting from the research. The program and site have been selected for their capacity to enrich the design outcome and the expression of the selected principles. The design outcome is focused on the development of the selected principles and their potential to enrich architectural design outside the Japanese culture.
Methods:

This research project involves both a research component and a design component. To identify specific architectural principles, which are important in Japanese culture, existing literature, both digital and printed, are used. The intent of the research is to develop a deeper understanding of these principles and their importance in Japanese culture. Existing case studies have been selected to identify how these principles are expressed in Japanese architecture.

The design phase of this project is a case study, which expresses the importance of the chosen concepts and the findings from the research. During the design process, various design explorations have been undertaken which involve developing an understanding of how to appropriately design with the chosen characteristics. These explorations are done through drawing and modelling various arrangements of spaces and through critical review which helps develop a strategy to begin designing the final case study. Each characteristic is explored separately through various experiments and design iterations. Experiments are undertaken to identify the architectural applications of the concepts which come from the research. From there the design of the museum is used as an exploration of the research in relation to the design requirements. After each design iteration, reviews are undertaken to enrich the outcome. Various drawings and models are used to present the selected characteristics, highlight how they are used and demonstrate the potential for new and enriching ideas in architectural design.
2.0: Research

“Light and Shadows
Tectonics
Materiality.”
2.1: Light and Shadows
In the book, “The architecture of natural light”, Henry Plummer defines the importance of natural light in architecture throughout history. He begins by stating that shelter and natural light have been the two most fundamental elements in architectural history. Shelter being the physical concept of protecting oneself from the elements, while natural light is the metaphysical; the connection between the man-made and the natural world.

Sunlight affects every part of our lives and without it, it would be impossible to live on earth. It is what makes it possible for us to see and hugely influences how we perceive the physical world. It is an energy source which allows things to grow. Through the understanding of these physical attributes, architects develop their designs to take advantage of the available natural light within the limitations of various climates and cultures. But we expect more than the practical benefits of natural light within architecture, we want an emotional connection with architecture, a building which feels alive. The use of natural light enables people to experience the flow of time in architecture, an ever-changing form which alters how we perceive things, how we feel. Natural light can be used to activate spaces which resonate with people, enabling the perception of a deep connection between the physical and metaphysical world.

“While buildings may be physically static, their ability to register changes and movement of natural light allows them to perceptually transform and display signs of life....”

–Henry Plummer.

To create a building which ‘moves’ people, natural light can be used to create an atmosphere which brings architecture ‘to life’. Plummer explores various ways that natural light is used and how it can accomplish this. He explains that in design the “orchestration of light” is important, the understanding that architecture can emulate the passing of time, the “rhythms of life”. By the use of natural light moving through the space, architectural spaces become ever changing, from dawn to dusk. This draws the attention away from the traditions of form and object of the architectural space but rather draws the focus to the atmosphere which is created.

7: Ibid., 18.
8: Ibid., 18.
9: Ibid., 154.
While natural light can bring architecture alive it cannot do so without the consideration of its opposite, shadow; there cannot be light without darkness, nor darkness without light. Kaoru Mende discusses the importance of shadows within architecture. In the book, “Designing with Shadow”, Kaoru emphasises that we do not focus on the light but rather the shadows which are cast, “…it is shadow not light that is usually the focus of our gaze.”

Darkness and shadows begin to add another layer of activation of architectural space, people look to the shadows which are cast from the light, provoking curiosity and mystery within a space. To create a captivating space, one should not just rely on the addition of light but on the subtle forms of shadows which are discovered in the minimal light.

Kaoru continues to explain the nature of shadows within architectural space. The reference of the white wall was used to explain the activation of space through the gradation of light, light fading into shadow. A new aesthetic sensibility is found in the use of non-uniform illumination. The gentle asymmetries created by the faint, fading light into a gradation of grey tones, and further into the darkness is a beauty worth appreciating.

The dynamic interplay between light and shadows is another way to activate the changing of perception of architectural space. Kaoru further explains that the contrast of light and shadow can be used as a sensory stimulant. Visually stimulating architectural spaces can be created by the iteration between light and shadow, hard light against hard shadow which can vary in intensity as time passes.

When thinking about the creation of atmosphere through natural lighting in architectural space, light is not the only factor for consideration, but shadow must also play an equal role in the activation of a stimulating space. Light can be used to move people through the space, to achieve a sense of progression. Natural light is used to connect the man-made world with nature, by emphasising the passing of time, bringing architecture alive. In addition to this shadow can be considered as a sensible aesthetic. Shadow can be used to give depth within the space, provoking curiosity in the darkness. The contrast between these two elements is used to stimulate the senses in architectural space.

11: Ibid., 11.
12: Ibid., 17.
Japanese Approach to Light and Shadow

Natural lighting in contemporary Japanese architecture has absorbed Western lighting techniques and adopted them to create some of the finest lighting applications to date; but what makes lighting in Japanese architecture so different to Western techniques? It essentially comes down to the differences in climate, topography and culture. Due to the hot and humid climate in Japan, the development of large overhanging eaves is used to shelter people from direct sunlight and the rain. Timber construction is the dominant form of construction with white paper infill of the Shoji Screen allowing the building to become breathable. This results in sunlight very rarely entering the building; rooms become progressively darker as you enter the building. Rather than bathing in direct sunlight, traditional Japanese interiors are immersed in the soft tones of filtered natural light.

“The aesthetic qualities of space within traditional Japanese architecture is said to be “experienced as much through darkness as light.”

- Vinayak Bharne.

The qualities that are considered beautiful in Japanese architecture, Jun’ichirō Tanizaki suggests in his book, In Praise of Shadows, “...must always grow from the realities of life, and our ancestors, forced to live in dark rooms, presently came to discover beauty in shadows...” And so, he writes, “that the beauty of a Japanese room depends on a variation of shadows, heavy shadows against light shadows - it has nothing else.” To appreciate the “quiet” simplicity of Japanese architecture, one must consider the aesthetic qualities of the drama created by the variations of shadows. The concept of the gradation of shadows within Architectural space appears as a powerful architectural aesthetic in Japanese architecture, which has been derived from traditions and heritage.

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14: Ibid., 17.
17: Ibid., 18.
18: Bharne, Zen Spaces and Neon Places, 104.

Chirari (glimpse), the beauty of the instantaneous, and the Zen idea of Satori (enlightenment) both appreciate the “fleeting sliver of a passing moment.” This cultural aesthetic of the acknowledgement of passing time and progression can be expressed through light and shadow design in architecture. Jun’ichirō Tanizaki addresses this by saying, “We delight in the mere sight of a delicate glow of fading rays clinging to the surface of a dusky wall, there to live out what little life remains to them. We never tire of the sight, for to us this pale glow and dim shadows far surpass any ornament.”
Japanese architecture uses light within spaces to express time and space. Shinto, “the way of the gods,” is the indigenous religion in Japan. Shinto does not just pay homage to their deities but also to the spirits which reside within nature. Japanese culture is about a deep respect and co-existence with nature. To show this connection with nature in Japanese architecture Daisetz Suzuki states, “If nature is to be loved, it must be caught while moving.” Japanese architecture, which is designed to accommodate the passing of time and the movement of the sun, has a deeper connection with the flow of nature, and the cycling of time. Variations of shadow are the essence of Japanese architecture while the injection of light cutting through the shadows creates a dynamic space which tells the tale of time and life itself.

Due to Japan’s hot and humid climate, Japanese architecture is well known for its screening devices to filter the light and to create breathable walls. Traditionally these screens where created from bamboo or a timber lattice, more recently they are also constructed with perforated metals. Other than their practical use of light diffusion, these screens are used as an aesthetic feature creating a sense of mystery, soft light contrasted against the timber creating an airy and mysterious feeling, as if the walls now become “half matter, and half spirit.” These techniques are also used to blur the line between the interior and exterior, bringing people closer to nature. In Zen and tea ceremonies, soft light would enter the space creating a calming and meditative space, while the screens of dense silhouetted lines emulated sitting in a dense bamboo grove, a natural environment. These screens simultaneously connect and disconnect people from the world outside.

Natural lighting in Japanese architecture comes down to its climate and culture. Their history and affiliation with shadows in architecture is unique, while the Western world bathes in direct light, Japanese architecture continues to appreciate the “quiet” simplicity of the gradation of shadows. Light is used to bring architecture alive by showing movement and the passing of time; culturally Japan accepts the notion of the passing of time, and expresses this through architecture.

25: Ibid., 176.
2.2: Precedent Studies

“Selected Projects Based on the Quality of Light and Shadows.”
The Koshino house consists of two parallel, rectangular boxes and a fan-shaped extension, which are all made from concrete. These concrete forms are partially buried into the sloped ground, placed carefully not to disturb any of the existing trees within the site. While the form responds to the site and the local eco-system, the interior concrete surfaces address the connections with nature through the “playful manipulation of light”.

Tadao Ando uses long narrow openings in the hallway to create, “complex crossings of natural light and shadow”. These patterns of light and shadows are the only ornamentation for these simple rooms. Similar openings have also been used throughout the building to create the same complex effect of the intertwining of light and shadows.

In the fan-shaped form there are cuts through the ceiling for the same reason as the other openings, but it has a completely different effect from the linear openings in the walls. The way the light enters the space and how it changes over the day leaves a subtle gradation of light and shadows rather than a complex array of patterns created by various linear openings.

28: Ibid.,

Left:
Fig 10: Complex Crossings of Light and Shadow
Right:
Fig 11: Two Parallel Boxes and a Fan
Fig 12: Light and Shadows Along a Curve
Fig 13: Light and Shadows from a Ceiling Cut
From the street, all you can see of Sun-Pu Church is a large cubic form clad with rough-hewn red Cedar strips. This irregular surface produces an interesting interplay between light and shadows, creating a dynamic façade which changes at every moment/angle. This untreated timber will turn a silver grey over time which will enrich the interplay of light and shadow.29

The interior is covered in horizontal slats, used for both acoustic and lighting purposes. The light enters through skylights and high windows filtering through the slats giving a “gauzy quality” to the chapel space. The atmosphere within the space is always changing with the time of day which brings the architecture alive. People enter a space which is ever changing.30

“The Church Sun-Pu required specific spatial qualities. Just thinking functionally about a church, it’s not much different from a classroom. But the space must feel very different, so I needed a strategy to control that environment directly. I manipulated the performance of the external walls and roof to control the light and sound conditions, which are what distinguishes a church from a normal classroom or meeting place”.31

-Tiara Nishizawa

30: Ibid.,
Left to Right:
Fig 14: Gauzy Quality of the Ceiling
Fig 15: Light and Shadows on Horizontal Slats
Fig 16: Dynamic Play of Light and Shadows on an Irregular Facade
The Sea Folk Museum collects, stores and exhibits the traditional tools which were used in the Japanese fishing industry. Due to the low budget, which was provided, Naito chose to focus on the concept of a good, simple shelter. From there he used a combination of traditional and contemporary methods to meet the requirements of cost and durability.  

“... to appreciate Naito's architecture.... You have to reflect upon the links with tradition and upon the cultural implications. You may not like some choices, you may not like some detail. But you will respect the effort and the consistency of it all, and will not be able to escape its powerful presence.”

-Vittorio Lampugnani.

The design consists of a simple gable structure which is constructed with an exposed laminated timber truss system. The light illuminates the space through a skylight which runs the length of the ridge. This skylight reveals, and draws your attention to, the timber structure, while the low windows of the northern façade are used to bring natural light across the floor plan. The combination of these two openings allows the space to be filled with constant natural light.

33: Ibid., 88.
Left:
Fig 17: Collection of Gable Forms
Right:
Fig 18: Skylight Through Exposed Structure
Fig 19: Low Windows and Skylight Illuminating Boat Exhibition
Fig 20: Simple Sheltered Form
2.3: Tectonics

Fig 21: Yusuhara Bridge Museum by Kengo Kuma
In architectural terms, tectonics refers to the expression of structure. A building in which the final form articulates the methods of its construction, often seen by the expression of forces acting upon the building.

Pure Visibility

In the essay; “Structure, Construction and Tectonics”, Eduard F. Sekler defines a clear distinction between the two concepts; structure and construction, as well as clarifying their relevance to the idea of tectonics in architecture.

The concept of structure refers to a system or the arrangement of members, which are used to cope with the forces acting within a building. The example Sekler uses is the system, post and beam.

The concept of construction on the other hand refers to the physical manifestation of the structural systems, which can be carried out in multiple ways. The post and beam example can be carried out with many materials which can be fixed together using various methods.

When the structural concept finds its manifestation through construction, the visual effect is determined by the expressive qualities of how the forces act in correlation with the arrangement of parts of the building. These visual qualities of the relation between form and forces are described by the term, tectonics.

Sekler continues by explaining that through the visual expression of structure through construction, which we call tectonics, architects can make a statement. Tectonics can be used to emphasise, to the viewer, the strong connection between the forces and the built form.

Charles Vallhonrat elaborates on these ideas in the article; “Tectonics Considered”, where he reinforces the idea that tectonics depends on the structural materials and the way in which they are put together, (structure and construction). He continues to elaborate by introducing the important idea of understanding gravity and how it affects the way we build and the ground the structure sits on. The understanding of the physics of gravity on earth now dictates mathematical restrictions to design; restrictions of the characteristics of materials and the limits of forces that they can bear. This in turn determines the structural sizes of materials and their limits.

In terms of tectonics, with the understanding of structural limitations and materials in terms of gravity, architects can design to express or emphasise the forces of gravity acting on the building, and, if one were pushing boundaries, tectonics could be used to emphasise the forces of gravity.

35: Ibid., 92.
37: Ibid., 125.
The modern view of space has become fundamental to how we perceive architecture. We have become incapable of reading/thinking about architecture without putting emphasis on spatial translation. Kenneth Frampton in, “Studies of Tectonic Culture”, addresses the issue of volumetric character in architectural form by enriching the priority given to space through tectonic concepts, the poetics of construction and the expressive potential of structural techniques.38

Gottfried Semper classifies the craft of building into two fundamental procedures; the tectonics of the frame and the stereotomics of earthworks. Tectonics is seen as frameworks of lightweight, linear components, while stereotomics is seen as mass and volume created by the piling of heavy, weighted elements. The distinction between these two concepts can be seen through the use of various materials, tectonics can be seen through the use of timber, which is seen to be light weight and tensile, while stereotomics can been seen through the use of compressive materials such as brickwork or reinforced concrete.39 Semper continues by explaining that climate and availability of materials plays a significant role in tectonic and stereotomics expression. He uses the example that in traditional Japanese architecture, through the abundance of wood, tectonic expression is dominant in their design, while in other cultures such as Middle Eastern cultures, stereotomic expression is dominant through building with heavy materials.40

From Semper’s distinction between Tectonics and Stereotomics, Kenneth Frampton elaborates the importance of the articulation of construction due to its symbolic importance to represent culture.41 Due to climate and materials being an important factor in the way buildings are built, architecture will vary significantly between cultures. So, from a technical and aesthetic standpoint, the expression of structure becomes important to the representation of culture/place within space.

39: Ibid., 5.
41: Ibid., 16.

Tectonics is often used to describe structural expression in architecture. But it also refers to the connections, the details which hold the structure together. Therefore, the role of detail becomes a crucial element which expresses the joining of two structural members. In the article; The Tell-The-Tale Detail, Marco Frascari examines the role details play in architecture. Frascari indicates that details express the process of attaching meaning to man-made objects. By saying this, details express both construction and meaning in architecture.42 To reiterate this, Jean Labatut notes that it is the study and execution of good details which makes architecture, that is, “the detail tells the tale”.43 The art of detailing relies on the joining of various components of the building in both a functional and aesthetic manner, and in failing to achieve this, will result in the failure of the building.44

The understanding of the concept of tectonics in architecture becomes important when identifying construction methods found within a specific culture. Identifying tectonic expression in the structure of the building and the details of joining are both equally important. By doing so, it is evident that there are limitations when trying to translate them to another culture. Identifying that there will be differences in the two cultures through climatic control, restrictions in materials and cultural perspectives. This will result in the development of specific tectonic expressions which can be adapted from one culture to another.

43: Ibid., 501.
44: Ibid., 501.

Fig 23: Kusakabe House

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Japanese Tectonic Expression

To develop an understanding of Japanese architecture one must not judge it based on western criteria. Even though their architecture may look similar to western architecture, the values in Japanese culture still hold sway in their architecture. 45

“When I look at a beautiful example of wood construction, I cannot help thinking that the beauty of the architecture derives not only from its design and construction techniques but also the very soul of the wood itself.” 46 – Kiyosi Seike.

The key to understanding Japanese architecture lies in their traditional values and attitudes. Nature is at the heart of Japanese architecture; their use of wood should be understood within its geographical and environmental advantages as well as its symbolic references in their religion. Japan is located on the Pacific rim, and, like many of the Pacific islands, is heavily forested due to its volcanic soil. There is, therefore, an abundance of timber for construction. The development of the craft of timber construction has become dominant in Japanese culture. 47 Their affinity to nature is due to their many myths and legends which immortalise nature, especially trees which are said to have spirits residing within them.

Historically, traditional architecture was impossible to read independently from its joinery and carpentry, due to the role the Japanese carpenter played; they are both the architect and the engineer. 48 Timber is the most elemental material in Japanese architecture, one of the most fundamental characteristics of Japanese architecture is the wooden post and beam system. Even though this system is not unique to Japanese architecture its means of connection is unique. Through the development of Japanese timber joinery, structural members are joined by means of Mortise and Tenon connections, using wedges or pegs as a method of securing the joints. 49

47: Ibid., 11.
48: Ibid., 7.
Japanese culture is heavily influenced by the concept of the natural cycle, cyclic renewal. Japanese architecture tends not to be built for permanence, they understand that timber is degradable and needs to be replaced. Understanding this, the tradition of timber joinery without the use of nails allowed the structure to become “reversible”. Timber structures can be dismantled without damaging their members, allowing for replacement of the degraded materials and reuse of existing members.

Tectonically, a fundamental characteristic in Japanese timber architecture is that the structure becomes the main element of design. The structure is not hidden but exposed to express form of construction, this is a Japanese design aesthetic – an aesthetic based on “spatial openness” and expression of materials.

The roof is the most dominant element in Japanese architecture, often seen as a large sweeping roof, a triangular volume, with deep overhangs, sheltering the spaces underneath from the weather. Like the post and beam system in Japanese architecture, traditionally the roof is carefully crafted from timber members, and constructed as a truss without the use of nails. The underside roof in Japanese architecture is seen to be more important than the top of the roof, and so the structure is not hidden, it is exposed to express its complex form. One of the essential elements of the roof structure is the rafter, from both a structural and aesthetic viewpoint. As this technique was favoured, carpenters began to develop more complex rafter systems, such as the fan-rib or radial raftering. This priority given to the expression of the roof changed how the spaces were laid out. The structural members to support the roof are arranged to support the roof structure, and the spaces are determined afterwards. You could say that Japanese architecture is designed from the roof down while western architecture tends to develop from the foundation up.


Even in contemporary Japanese architecture, the fundamentals of Japanese tectonics are the same, being true to the natural form of materials as well as being expressive of the structure through a keen eye for detail and connections. The freedom of design through the lack of formal regulations in the urban context allows Japanese architecture to be expressive in its freedom of experimentation and design. There are a vast array of tectonic approaches, but as mentioned above, to understand contemporary Japanese architecture one must first understand their traditional values and attitudes, which are still prevalent in their design.

2.4: Precedent Studies

“Selected Projects Based on the Quality of Tectonic Expression.”
The Komyo-Ji Temple project involves a reconstruction of a Jodo-Shinshu temple which was originally built in the Edo period. The main themes for this project were to respond to the local context and to have a modern interpretation of traditional Buddhist architecture which was symbolised by timber. The overall design consists of a heavily tectonic timber hall, afloat on a pond, which is surrounded by a contrasting stereotomic concrete chapel, as well as the residential quarters. The timber chapel is constructed using four columns of four members supporting a series of layered beams supporting the roof structure. The roof then is cantilevered out creating a large eave which fans out over the pond, constructed in several layers. It is a very solid looking roof system which is supported by what seems to be minimal supports.

Left to Right:
Fig 28: Layered Supporting Beams
Fig 29: Tectonic Timber Wall Afloat a Pond
Fig 30: Fanning Roof Detail
Fig 31: Four Clusters of Columns
The Yusuhara Wooden Bridge Museum is an attempt to integrate two public facilities (Hotel and Spa), by using a street, and the wooden bridge. This bridge is used as both a connection route and an exhibition space. The structure is built from LVL timber, from locally sourced cedar. To support local industry, it was decided to use smaller LVL members to support the structure, rather than larger members which would have been manufactured out of town.\(^{57}\)

The structural system used to support the bridge, the bracket system, is used traditionally as the roof structure in both Chinese and Japanese architecture. This technique is especially beautiful from the view below and therefore is used as an expressive structural support for the bridge.\(^{58}\)

\(^{57}\): Frampton and Kuma, Kengo Kuma: Complete Works, 209.
\(^{58}\): Ibid., 209.
Left to Right:
Fig 32: Exposed Timber Roof Structure of the Wooden Bridge
Fig 33: Bracket System Supporting the Bridge
Fig 34: Timber Column and Steel Frame Supporting Bracket System
Fig 35: Bracket Support System Underside View
The Archery Hall & Boxing Club consists of two buildings, an archery hall and a boxing club, located on the grounds of Kogakuin University in west Tokyo. The brief was to use locally sourced timber on a low-budget to create an accessible and inspiring space for students.

This resulted in the two buildings being constructed with a gable system with the use of traditional timber techniques allowing the buildings to be free of columns and open. In the archery hall, the roof structure is composed of a series of slender beams and posts which form a lattice to span the hall. A bolder approach was taken in the boxing club, through the use of a stepped frame.

“We have salvaged the purity of traditional Japanese timber composition, simply made up of horizontals and verticals, which has been somewhat disregarded ever since the advent of modernism in Japan… Timber, a historical material, has now been reanalysed and transformed into a new building material.”

-FT Architects.

60: Ibid.,
Left to Right:
Fig 38: Stepped Frame Structure
Fig 39: Stepped Frame Detail
Fig 40: Timer Lattice Structure
Fig 41: Timber Lattice Detail
2.5: Materials
Japanese Materials:

Japan is well known for its innovative and alternative thinking with regards to materials and construction in their contemporary architecture. Their methods of construction in traditional architecture has been refined over generations of craftsmen, ever developing and adapting to the advancement of technologies. The Japanese strive to connect with nature, which is seen through construction and the use of natural materials. In the design it is import to connect with the site and the qualities of ceramics. The selection of materials in this project are determined by their relevance to traditional Japanese architecture and its connection to the local context of the site. The three primary materials used are; timber, stone and earth.

Timber

Traditional Japanese architecture is most well-known for its use of timber and the use of sophisticated wood joinery. The islands of Japan are heavily forested with many varieties of trees which allow for ease of sourcing the material. The Sukiya-style of architecture was known for its cataloguing of the qualities of each timber, using them for different parts of construction to express their qualities. Japanese cypress is the most common timber which was used for the structural elements, while Japanese cedar was used to create timber panel and carpentry.

Throughout New Zealand's architectural history, timber has been one of the main materials used in construction. Māori primarily used timber to build their dwellings, marae and storehouses. After the arrival of Europeans there was a demand to build various structures. Due to the abundance of trees, early New Zealand architecture was constructed from wood, such as Kauri. New Zealand is among one of the highest users of Radiata pine, used primarily for construction.

Stone

Stone is the most permanent material used in traditional Japanese architecture. Due to its durability, stone was used as the foundation underneath columns or walls, it was also used as retaining walls and terracing levels. The stone most commonly used was granite, a dense stone which works best structurally. Granite is hard to work with and so the use of Oya Tuff, a softer stone, for decorative purposes. A slate stone, Tepper-seki, was used as a roofing material. Stone is very common in Japanese landscaping, for pathing, and ornamentation. Gravel and sand is used to represent water.

As in Japanese architecture, Māori architecture did not use stone structurally, stone was only used in the construction of paths and walls. With the arrival of Europeans, the abundance of timber led to buildings often being made from wood. Due to the lack of timber in Canterbury, Christchurch opened up numerous stone quarries, therefore many buildings are built from stone.

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64: Locher, Kuma and Simmons, Traditional Japanese Architecture, 80-83.
Earth

Earth in construction is prevalent in many cultures and is a readily available and versatile material. Earth is used for climatic control, it is a good insulator and strong against wind. Earth walls are used in Japanese architecture but are not very common. Earth in Japanese architecture is commonly as a mud plaster, used to create a weather tight building. Various colours and textures can be applied to the finish of the wall. Earth is also used to create clay tiles for roofing.

In contemporary architecture, the use of earth is common in sustainable and earth building practices. Earth, in particular clay, is the primary material used in the craft of ceramics. Clay is readily available in Canterbury and its use in the project design helps establish a relationship between the architecture, site and ceramics.

Substance

Before the 19th century, timber construction was the custom throughout Japan. There was a strong relationship with the human scale and a deep connection with the qualities of timber. This attitude to architecture reflected Japanese tradition and their deep respect and co-existence with the natural world, influenced by Shinto and Buddhist teachings.

Since the tragedies of the Kanto earthquake and the defeat in WWII, concrete became the dominant form of construction in cities, resulting in the destruction of Japanese spirit and their relationship natural environment.

With the introduction of concrete in Japan, Kengo Kuma states that, “if we want to get back the spirit of respect for nature, we are going to have to discover new materials that can replace concrete and use them to construct buildings, create cities and improve people’s sensibility.” From reflections on the design approach, structure and finish, Kengo Kuma has drawn the conclusion that the word “material” has the connotation of “finish”. Rather than “finish”, material should be associated with the concept of “substance”, substance being the essence or the characteristics of a material. To rethink how we view materials we must disassociate ourselves from the idea that structure and finish are two separate things.

“No matter how rich the tactile qualities of materials are, if they appear as single masses, then to me they are not vivid, because they do not change their expression. If Materials are thoroughly particalized, they are transient, like rainbows.”

Kengo Kuma.

From this we can learn that if we wish to re-animate our connection with nature through architecture we must first redefine how we use materials. Rather than associating materials with the finishes of an architectural project, we need to approach it with the concept of ‘substance’. What are the qualities of a selected material, how can we demonstrate or display these? By understanding the essence of the material, you can utilise it in various different ways. For example, in traditional Japanese architecture, timber is used as the structure but it is also used to create fine and delicate frames and screens. In both cases the use of timber is evident, but they both emphasise different qualities. By understanding the ‘substance’ of a material, the architectural palette can be refined to a few materials which can be used in multiple ways to emphasise their specific qualities.

67: Locher, Kuma and Simmons, Traditional Japanese Architecture, 83-84.
69: Ibid., 16.
70: Ibid., 18.
Patterns have been associated with the idea of decoration and ornamentation. The idea of patterns can be taken beyond decoration; it can be developed into the theory of spatial patterns. In terms of Japanese architecture, the intent is to create space which is neither inside nor outside, to create an intermediate space which connects the interior space with nature. This is achieved through a sequence of screening devices, sliding doors, shoji screens, and folding curtains, which all hold a degree of permeability which blurs the definition of the division of space. This leads to a production of spatial patterns which are non-hierarchical, transitional and de-centralised. Through the creation of a multi-layered building envelope, these soft boundaries constituted a design strategy which allows for environmental control. Different material treatments for the screens allowed for a varying degree of permeability which resulted the control of natural lighting and ventilation throughout the spaces.

Another method of defining space within Japanese architecture is the use of the tatami mat. The tatami mat is a traditional floor covering in Japanese buildings. The tatami mat is made from woven rush on top of straw, with a cloth border to prevent fraying. The sizes of the mats differ throughout Japan; however, the dimensions are always exactly at a 1:2 ratio. The tatami room is designed to be a multi-functional space and the number and layout of the mats are used to give definition to the size of the space.

Hence in Japanese architecture materials are used to define space. Screening devices can define spaces while at the same time blur boundaries. This creates a series of spaces which fade from interior to exterior. The use of floor materials can also define space. You can define the separation between spaces through pattern. Even though there may be no physical separation, the use of materials can create separation between two functions within the same room.

74: Ibid., 15.
75: Ibid., 118.
77: Ibid., 274-275.
Fig 50: House of Holly Osmanthus by Takashi Okuno
2.6: Precedent Studies

“Selected Projects Based on the use of Materials.”
Hermes Gion-mise is a conversion of a teahouse/residence into a store. Located on a designated historical landscape preservation and improvement district, the exterior had to be left as original. The residence composed of various small rooms with hallways connecting them. To achieve the function of a store it was necessary combine these small rooms without compromising the structure of the building.\footnote{Archdaily, “Hermes Gion-mise/ ODS,” last modified February 1, 2017, http://www.archdaily.com/803539/hermes-gion-mise-ods} There is a lot of timber used in the design. The timber is used in various ways, mainly through colour, to define and highlight spaces. The “kigumi” timber technique is used to create furniture and fixings along the walls because the store is not permanent. When the store is closed the timber can be reconfigured and adjusted for another purpose.\footnote{Ibid.,}
Left to Right:
Fig 51: Temporary Fixtures with “Kigumi” Boxes
Fig 52: Preservation of Facade
Fig 53: Exposed Beams, Dark Columns and Orange Outlines.
Fig 54: Gutted Ground Floor, Existing Exposed Structure
Aspen Art Museum: Shigeru Ban Architects

Project Year: 2014.

Location: Aspen, USA

The Aspen Art museum is the first permanent museum to be constructed in the U.S.A that was designed by Shigeru Ban. The vision for the design is based on transparency and open view planes, creating engagement and interaction between the exterior and interior.

Screening devices, weaving timber and other patterns are used to define spaces while blurring the boundary between the interior and exterior. The use of an exposed timber space frame creates depth within the space.

Left to Right:

Fig 55: Weaving Timber Screen
Fig 56: Interior Exposed Timber Space Frame
Fig 57: Circular Screen Separating Transitional Spaces
Fig 58: Exterior Exposed Timber Space Frame
Adobe Museum for a Wooden Buddha: Kengo Kuma

Project Year: 2002.

Location: Shimonoseki, Yamaguchi, Japan

This ‘museum’ is a storage facility which contains the largest wooden sculpture of Buddha in Japan. Traditional store houses were created of timber with a clay finish, however, in the Toyoura district adobe brick is used. The design uses traditional building methods of sun dried brick. The aim is to integrate materials, environment and structure into the architectural outcome.\textsuperscript{81}

\textsuperscript{81} Frampton and Kuma. \textit{Kengo Kuma: Complete Works}, 247.
Left to Right:
Fig 59: Vertical Timber Interior Finish
Fig 60: Building Materials Integrated with the Site
Fig 61: Various Methods of Laying Adobe Brick
Fig 62: Adobe Brick
3.0 Design:

“Exploration and Design Based on Research, Site and Programme.”
3.1: Programme

Ceramic Museum

The programme has been selected as an investigational function to test an architectural outcome. The desired function for the building is selected to support the expression the architectural qualities of the research. A museum requires specific lighting needs which can be explored in depth using natural light. For example, the lighting conditions to illuminate three dimensional ceramic objects. Freedom of design allows for tectonic expression in relation to site, exhibition and experience. Materials can be used to express the earthy qualities of the ceramics which are exhibited in the museum. This can be done with natural materials, such as timber, stone and earth. These applications for the materials can vary, giving the opportunity to define space and circulation patterns.

“At the beginning of the planning, the content should be at the forefront. What story should the visitor be told? What central content should he experience? What pattern should the visitor experience follow? It is still not about space, but about the content of sequence.”

Christine Kappei.

There is a desire to have a connection between New Zealand and Japan as the exhibition for the museum. Bernard Leach is a British potter who spent many years studying ceramics in Japan. Leach’s works and teachings are heavily influenced by Japanese philosophy and inspirations. Pottery and ceramic works in New Zealand still hold the works and teachings of Bernard Leach in high regard. “A Potters Book” has become the ‘Bible’ for New Zealand potters. This resulted in a ceramics museum being chosen for the museum function.

Ceramics have an earthy and fragile quality to them. Tectonics can be explored to express these qualities by contrasting or emphasising them through the way they are exhibited; how they are placed, where and what is surrounding them.

83: Ibid., 13.
Spatial Requirements

Museum:
- Permanent Exhibition Spaces.
- Temporary Exhibition Spaces.
- Storage Facilities
- Workshop Space.
- Administration / Offices.
- Transitional Spaces.

Public Space:
- Viewing Area.
- Café.
- Information.
- WC Facilities.

Other:
- Car Parking
- Bike Stands
- Pathways
- Stairs and Ramps

Fig 64: Japanese Ceramics
3.2: Precedent Studies

“Selected Japanese Museums.”
Miho Museum: I.M. Pei.
Project Year: 1997.
Location: Shigarakicho Tashiro, Koka, Shiga Prefecture, Japan.

The design intention for the Miho museum was to “break new ground”, using space frames and sloped glass to enrich the interior material selection of limestone and coloured concrete. The project sits within the mountain side of a nature reserve near the town of Shigaraki.85

The spaces are laid out to express the idea of, “Peach Blossom Valley”, a Chinese tale. Using circulation pattern routes, you are taken on a journey through the building as it tells you the tale.86 The building is made up of a central atrium and two wings, North and South wing. To enter the museum, you must walk over the bridge transitioning from one side to the other, up a flight of stairs from the courtyard into the atrium space.

86: Ibid.,
Left to Right:
Fig 65: Entry to the Museum Via the Bridge
Fig 66: Atrium Space and Hallway to Exhibition Wing
Fig 67: Exhibition Wing with Skylights
Fig 68: Layout Showing Corridors Leading off Central Space to Exhibition Halls
The Chichu Art Museum is a project which defies the conventions of traditional architecture. In response to the site, Tadao Ando sank the building into the ground to blend into the surroundings. This museum is designed specifically to house the works of three artists, and although the building is buried, the lighting of each exhibition space is achieved using natural light.

The project consists of several exhibition spaces, administration block and café, which are all connected by courtyards and hallways. These transitional spaces are used to produce a sense of progression, as you wander deeper into the museum, illumination is achieved through natural light coming through sky lights or openings. To get to the exhibitions the visitor enters through the administration area and along the transitional hallway. From there you enter a central area which splits off into three exhibition spaces.

Left to Right:
Fig 69: Natural Light used to Show Progression
Fig 70: Natural Light Entering Exhibition Space
Fig 71: Aerial View Showing Openings
Fig 72: Layout Showing Hallway Connection Administration and Exhibition Spaces
The Koshinokuni Museum of Literature is situated by the river Matsu which runs through the Toyama prefecture. The goal of this project is to regenerate the area by refurbishing existing buildings and to add a new exhibition block which is used for the literature museum. The existing building is used to house the administration.  

The site is designed to be a continuous landscape that originates from the river. The approach route takes you through various gardens as you make your way to the museum. The route continues through the museum to connect to the other end of the site. There are many thresholds that you must cross to enter the building. Long corridors are used to guide you through the spaces. The circulation for this project has two main axes, a North South axis and an East West axis. From these axes there are various secondary hallways connecting individual spaces.

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89: Ibid.,
Left to Right:
Fig 73: Threshold to Enter the Museum
Fig 74: Access Route Through Gardens
Fig 75: The use of Natural Light to Illuminate Exhibition Space
Fig 76: Layout Showing Primary and Secondary Circulation Routes and Entry to Site
3.3 Site:

Witch Hill

The site was selected based on the possibilities of enriching an architectural outcome. It is in Christchurch, on the Port Hills along Summit Road and at the base of Witch Hill. The History of earthquakes makes the site distinctive. The concept of fragility in the landscape can be used as a juxtaposition to the tectonic exploration in the design.

The site is on a slope giving rise to design restrictions and limitations. This will allow for an interesting design exploration of the selected characteristics, as well as a design response to local context. Being on the Port Hills, there are many possible views and vistas which can be utilised in the design. A museum predominantly draws your attention internally, towards the works on display. Using vistas can draw the visitor’s attention away from the exhibits, externally giving them a break and adding another depth the museums experience.

The design programme is to be a museum of ceramics. A large artistic community lives near the site in and around Lyttleton and Christchurch. The site itself is not on the direct axis of these two points but is easily accessible by car and the Rapaki track.
Climate:

The site on the Port Hills of Christchurch, on the East coast of the South Island, where temperatures can vary significantly throughout the year.

During Summer months, it is dry and often in draught. Temperatures range on average between 4-31°C with rainfalls of an average of 43mm monthly.

In winter months, it can be cold and wet. Temperatures range between -5-18°C, with rainfalls of an average of 53mm monthly. During these winter months, there is often snow which can settle on the Port hills. There have also been extreme rains and sometimes flooding which occurs in the Canterbury region, but often Canterbury is dry due to the Southern Alps which stop the western fronts which carry rain.

Due to the site’s location near the coast, the main wind direction comes from the East/North-East daily, but when a cold front arrives the wind often comes from the South/South-West.

Geology:

The site is located on the Port hills, which is the rim of an extinct volcano, now Lyttleton Harbour. Per the, “Canterbury Earthquakes 2010/2011 Port Hills slope stability: Geomorphology mapping for rockfall risk assessment”, the site is made up of various ground conditions, the two main categories being; Rock at/near surface and Colluvium. Since the earthquake, the site itself is relatively unchanged. The issue is the potential hazard for boulders to break off the cliff above the site and roll down the hill. Resulting in the idea of uncertainty, which adds to the fragility of the museum.


Left:
Fig 78: Site Location Map

Right:
Fig 79: Site Analysis Map
Fig 80: View of the Site
Fig 81: Southern View from the site
Top to Bottom:
Fig 82: Southern Panorama View
Fig 83: Northern Panorama View
3.4: Design Exploration One

“Exploration Focusing on Light and Shadow.”
**Exploration 1.1:**

The purpose of this design is to investigate how light and shadow can be used to alter the way we perceive the room. Certain lighting techniques can be employed to draw your attention to a specific area, while others create a dynamic space through the movement of complex patterns. Understanding these principles will allow one to employ techniques to establish a specific atmosphere within an architectural form.

This is investigated through various iterations of a defined space. Keeping the space consistent while the only variable is the changing of openings. This allows for an in-depth understanding of the use of appropriate methods for specific spatial qualities.

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**Fig 84: Lighting Techniques for a Standard Room**

**Fig 85: Lighting Techniques for a Hallway**
Fig 86: Lighting Techniques for a Double Height Space

Fig 87: Lighting Techniques for a Spiral Room
Exploration 1.2:

To further investigate the use of light and shadows to create specific spatial qualities, various iterations of a collection of spaces is used to investigate the differences in 'lingering' spaces and transitional spaces. Dynamic and contrasting light patterns are best used in transitional spaces while gradations in light and shadow is best employed in 'lingering' spaces.

Fig 88: Iteration One Expressing Wall Planes
Fig 89: Iteration Two Roof Plane and Hallway Lighting
Fig 90: Iteration Three Horizontal and Vertical Lighting

Fig 91: Iteration Four Lighting Expressing Roof Plane
Exploration 1.3:

An assortment of spaces selected to investigate the relationship between materials and, light and shadow. In conjunction with light and shadow, materials can be used to change how one perceives a space. Various materials can be used to enrich the lighting qualities of the space, while others can soften its effect. Materials can affect perception the architectural space in terms of temperature; the differences between warmer colours and muted colours can affect how one reacts to a space.
Fig 95: Basic Room with Timber Walls and Concrete Floor

Fig 96: Basic Room with Concrete

Fig 97: Basic Room with White Walls and Timber Floor
Fig 98: Roof Illumination With Concrete View 1

Fig 99: Roof Illumination With Timber Walls and Concrete Floor View 1

Fig 100: Roof Illumination With White Walls and Timber Floor View 1
Exploration 1.4:

One selected space is used to showcase the application of various tectonic and stereotomic approaches to the roof plan and its effect on the architectural space. Whether you want to emphasise the depth of the space, complexity or simplicity, the level of tectonic expression has a significant impact on how one reacts to architectural space.

Fig 104: Roof Illumination with Flat Ceiling

Fig 105: Roof Illumination with Exposed Beams
Fig 106: Roof Illumination with Gable Roof

Fig 107: Roof Illumination with Layered Structure
Design Exploration:

The purpose for this exploration is to investigate how the selected principles can be used together as an architectural response to a specific building typology. Even though the selected site is sloping the intention is to investigate the internal aspects of the design. Therefore, the design in this exploration is located on a ‘non-site’, surrounded by walls which indicate the internal focus of the design rather than the connection to a surrounding context.

The design is split into three buildings, an administration block, a school and museum. The focus of the project is on the development of the museum. The design process for the museum is to create a series of connected exhibition and transitional spaces, to investigate an appropriate circulation route, the defined loop.

The form for the museum is to be a simple rectangular form with a series of stereotomic concrete plains slicing through the form to separate the various spaces. Openings in walls and roof are used throughout the museum in the attempt to draw people in and guide them through the series of spaces. In the exhibition spaces, lighting techniques and materials are used to create subtle spaces where the attention of the visitor would be on the exhibition pieces rather than on the architectural space. In the transitional spaces, however, the intention is to use lighting techniques and tectonic approaches to create a stimulating space. This is intended to create a dynamic architectural form where people’s perceptions continuously change as they progress through the museum.
Exhibition Space and Hallway:

The exhibition space uses neutral colours to create a ‘quiet’ space where people view the pieces. Direct light is used to illuminate the concrete plane which cuts through the space. The gradation of shadows is used to emphasise curiosity and mystery within the space.

The hallway is designed to have multiple vertical openings which let light into the space, creating a complex pattern of light and shadow drawing people through the space. The space is not a lingering space and the lighting technique is intended to ‘force’ people through the space.

Internal Transitional Space:

The transitional space is intended to use light as a stimulus, drawing people’s attention to the various materials and textures used within the space. The layers of roof planes are used as a tectonic exploration, expressing the connections between solid elements, steel and timber. Timber lattices and openings are used to create complex lighting patterns within the space.

Left:
Fig 108: Site Plan Explaining the Layout of the Museum in Relation to the Rest of the Site
Right: Top to Bottom
Fig 109: Perspective Showing Quiet a Exhibition Space and Complex Patterns in the Hallway
Fig 110: Perspective of the Transitional Space with Timber Lattice Roof Structure
Exhibition Space and Exterior Hallway:

The exhibition space explores the use of natural colour and textures to create a warm space for viewing the art pieces. A more dynamic lighting approach is used for this design, highlighting the route through the series of spaces. A timber lattice is used to create a complex lighting pattern which is cast across the floor and the timber wall.

The External hallway is designed to coincide with the concrete planes through the use of a series of concrete frames. In contrast to the stereotomic nature of the concrete, the use of timber vertical lattices is used to break apart the hallway, blurring the barrier between the interior and exterior. Lighting patterns are used to guide people through the space.

Final Exhibition Space:

The final exhibition space is used to explore the combination of natural and neutral colours and textures within a space, and how this can be used to create a ‘quiet’ space where people can calmly view the pottery. Various lighting techniques are used to draw your attention into the space as well as create a soft illumination throughout the space. Stereotomic planes are used to avoid the over stimulation of the space.

Top to Bottom:

Fig 111: Perspective Showing the use of Natural Materials and Dynamic Lighting Patterns
Fig 112: Perspective Showing the Exploration of Materials and the use of Different Lighting Techniques
Internal Courtyard:

The series of spaces are wrapped around an internal courtyard which can be accessed at various points throughout the museum. This is an attempt to connect the interior and exterior spaces, where possible, creating an exterior exhibition space. The use of the pond creates a calming and peaceful response to the architecture. Various timber walkways and planes are used to create the pathway; the diagonal is used to contrast against the linear approach to the design, adding a level of complexity and dynamics to the design.

Fig 113: Perspective Showing Internal Courtyard Created Through Timber Paths Surrounding a Pond
Design Exploration Review 1:

Exploration 1.1-1.4:

These design iterations are used to develop an understanding of how various approaches of the selected principles can be used in architectural design. They explore the way these affect the internal qualities of the architecture and how one will react/perceive the space created. The issue with this approach is that you are analysing a single moment in time. This allows for a basic understanding of architectural space, but further development is needed to analyse the change of space over time, particularly with regards to the effect of light and shadow in architectural space.

Design Exploration:

This design exploration is based on the investigation of internal elements which is why a ‘non-site’ is used, thus providing an inward focus in the design. This results in a very generic outcome, there is no contextual or cultural influences in the design. Eventually connection with the site and the surrounding context is important to design and how it behaves in relation to the climate and culture.

In terms of the investigation of the selected principles, the focus in this design is on the application of natural lighting of a space. It explores the way gradation of natural light is best suited to exhibition space while in transitional zones contrasting elements are best. Spot lighting for certain architectural forms or art pieces can also be used. The design results in a stereotomic form rather than the application of tectonic expression. Exhibition spaces require a neutral palate, they should be either black or white, the focus being on the exhibition artefacts and not the space. In the transition spaces, there is further exploration of materials, both in colour and texture, and how these affect the atmosphere of the space.

The understanding of where the exhibition pieces will be laid out and presented is important to consider when designing spaces. Exploring the space in perspectives it is hard to give the spaces justice since there is no consideration of presentation of the exhibits.

The representation of the design and the principles makes it difficult to understand. Further investigation is required to understand the best way to display/present the design in terms of the selected architectural elements. Being more conceptual rather the literal may be best to present the design.

From this design selected lighting techniques are used and developed in further design iterations. Long vertical openings are used to emphasise contrasting light patterns, which are primarily in transitional spaces and for selected illumination in the exhibition spaces. Roof lighting is further investigated in relation to both contrasting and gradational lighting techniques. The use of large over hangs are investigated along with the use of partition walls in to control direct light in the attempt to control the effect of in shadows in design.
3.5: Design Exploration Two

“Exploration Focusing on Tectonics.”
Exploration 2.1:

Following design exploration one there is an obvious lack in the understanding of tectonics in architecture. The purpose of this exploration is to gain an in-depth understanding of construction and tectonics in Japanese architecture. Through the research of Japanese tectonics three selected projects are used as precedents, to analyse the construction and tectonics of these projects 1:1 digital models have been constructed. These models help to provide an in-depth understanding of how these are constructed, which are influential in the design outcome.

Left-Top to Bottom:
Fig 114: Sectional Cut of Model Based from Yusuhara Wooden Bridge Museum Drawings
Fig 115: Elevation of Structural Model Based from Yusuhara Wooden Bridge Museum Drawings
Above:
Fig 116: Internal View of Hallway Based from Yusuhara Wooden Bridge Museum Drawings
Above:
Fig 117: Internal View of Structure Based from Drawings of the Komyo-Ji Temple

Right-Top to Bottom:
Fig 118: Sectional View of Structure and Roof Based from Drawings of the Komyo-Ji Temple
Fig 119: Exterior View of Fanning Roof Detail Based from Drawings of the Komyo-Ji Temple
Fig 120: Partial Model of Archery Halls Timber Lattice Structure

Fig 121: Close-Up View of Timber Lattice Based from Drawings of the Archery Hall
Fig 122: Partial Model of Boxing Club's Stepping Roof Structure

Fig 123: Close-Up View of Stepped Roof Structure Based from Drawings of the Boxing Club
**Design Exploration:**

Through the result of the research and previous explorations, the intent of the design is to investigate various tectonic qualities as well as develop a further understanding of light and shadow qualities. At this stage of the design process the introduction of site is necessary to assist in the exploration of tectonic response to a sloped site. The design is split into two distinct buildings. The cantilevered structure which is used for the administration, café and viewing area, and the curved building which houses various exhibition spaces.

The design is used to explore various tectonic and lighting conditions. This attempts to use each space to explore different spatial qualities which have been designed to explore the selected research. The cantilevered building is used to explore the tectonic qualities of the support structure, the contrast between tectonic and stereotomic forms which are used to define spaces. Stereotomic forms present the transition between the two levels, this is used as a contrast to help emphasise the supporting cantilever. The exhibition area is defined by two spaces; the curved structure exhibits larger ceramic objects, while the other houses a smaller collection of ceramics. The exhibition spaces are treated in different ways, exploring the selected principles in relation to the intended ceramic selection.
Atrium:

The atrium space is designed to make a grand statement when you enter the building. A high ceiling inspired by the Komyo-Ji Temple creates an airy space. The layering of the structural members creates depth within the space. Natural light enters the space illuminating it, while various layers of shadows give a sense of mystery to the roof structure.

The timber screens define the atrium space and the transitional and cantilevered spaces. Rather than a clear definition of spaces created when using a solid wall, the timber screen allows for light and semi fluidity between the spaces.

To further enhance the importance of the roofing structure, different materials are used. Light-coloured materials are used as the structural members while darker materials are used for the surrounding wall to give a clear definition of the tectonic qualities of the structure.

Transitional Space:

In the transitional space contrasting techniques are used, unlike the gradation approach in the café and atrium spaces. The transitional spaces are designed to be stereotomic, using concrete as the main material. This also helps structurally to reinforce the relationship of the structure to the site.

In contrast to the gradation approach to lighting the café and atrium spaces, contrasting lighting techniques are used in the transitional space. Contrasting light emphasises movement and time passing as the space is always changing.
Timber Cantilever:

The timber cantilever is intended to be the main architectural element for this design. The timber cantilever is used to explore Japanese roofing techniques as structural supports rather than the roof structure. The design is heavily influenced by the Yusuhara Wooden Bridge Museum, which uses this technique as a structural support between two elements. The design explores the possibility of using this technique as a cantilevered support.

Dark vertical timber cladding enriches the visual tectonic qualities of the structure. Concrete for earthworks, staircases and ramps achieves the same visual enhancement of tectonics.

Rapaki Track:

The museum is at the top of the Rapaki track. Visitors approach the building from below and arrive on a platform underneath of the cantilever structure. The platform design uses the influence of the tatami mat to define the desired path of movement. Entry to the museum is from this platform via the covered walkway.

Top to Bottom:
Fig 130: Perspective View of the Timber Cantilever and the Structural Support Inspired by the Yusuhara wooden Bridge Museum
Fig 131: Perspective View of the Building from the top of the Rapaki Track and the Platform Leading to the Enter of the Museum
Exhibition Space 1:

This exhibition space is used to display larger ceramic pieces. The design of this space explores the lighting qualities of a curved space as well as supports the investigation of the tectonics which result from the curved space.

Various studies of the space over time are used to study how the light moves throughout the space.
Exhibition Space 2:

This exhibition space is used to display smaller ceramic pieces. The design of the space explores the tectonic qualities of the display areas. Investigation includes using the wall as a means of display. Further exploration of roof design in this space involves the investigation of a different ceiling treatment. Rather than a flat timber sheet, depth is created using a timber batten finish.

Various studies of the space over time are used to study how the light moves throughout the space.
Design Exploration Review 2:

Design exploration 2 involves the investigation of tectonics based on the research. This exploration also allows for further development in lighting techniques and the differences in the qualities of both gradation and contrasting techniques. The introduction of the site provides a far richer design outcome in relation to the selected principles. Further development in spatial needs of the programme allows for various spaces that can be used to investigate different spatial qualities.

In relation to the investigation of the selected principles, the focus for this exploration is to design as many different conditions as possible for review and refinement for later development. Doing this causes the design to be incoherent. There is too much activity which makes the design difficult to understand. Further refinement is necessary to create a cohesive design.

In terms of the tectonics in the design, there is the opportunity to develop an understanding of the display of the structure and construction of the design. There needs to be more exploration of the basic forces which act upon the structure. Returning to the basics and understanding of the forces, compression and tension, will help enrich the design with use of different materials and construction to emphasise the differences between the acting forces.

There is a greater investigation and development of the lighting quality within the design. The achievement of this exploration has been in lighting up the spaces. To add another layer to the design the investigation of 3D object illumination is required. Investigation is needed into illumination of the ceramic objects within a space and emphasising the importance of this in the design. Light studies and spot lighting are necessary for further development.

In this design, material use and qualities is lacking, there needs to be further investigation of material use and qualities which are important in Japanese architecture. Understanding this helps refine the material palette in the design, as well as determining where they are appropriately used. In terms of spatial design, materials can be used to differentiate spaces, or for architectural enrichment.

Emphasis is on the investigation of the selected principles. Relation to context and site is lacking. The floor plan is spreading randomly across the northern slope, while some of the most attractive vistas from the site are the southern view and Witch Hill. Development of the design in relation to the visual attractions of the site is needed. Bring the building back onto the flat and leaving the cantilever as the only element on the northern slope provides a richer contextual influence to the design.

Relation to programme needs development; how can ceramics be influential to the design? What are the qualities of ceramics which can be emphasised? Ceramics are fragile and delicate, how can the design of the architecture and display help emphasise this?

From this design, the architectural aspect which is developed in the next design iteration is the use of the cantilever, which is the most dominant architectural feature in this design. Further investigation in construction and materials are needed to achieve a richer outcome. The material and construction combination is developed to further explore the elements of Japanese architecture, as well as the connection with the site and the fragility of ceramics.

The structural techniques to support the cantilever and the roof structure; in both the atrium and exhibition space 1 have been selected to be developed to the next design. The vertical openings are still carried into the next design development in terms of expressing contrasting light patterns on top of developing the technique of direct lighting of 3D ceramic objects. Variations in overhangs and eaves along with the use of screens, has been selected to be carried into the next design stage.
3.6: Design Exploration Three

“Exploration Focusing on Materiality.”
Exploration 3.1:

The purpose of this exploration is to investigate materiality. From the last design, it is obvious that the material selection and uses are lacking. This exploration identifies the materials, which are used in the further development of the design and how they relate to one another. These ten models use various combinations of the selected materials set into different compositions.
Fig 147: Model Four - Combination of Dark Stone and Layers of Matter Ceramics

Fig 148: Model Five - Combination of Glass, Timber and Concrete with Exposed Aggregate

Fig 149: Model Six - Combination of Matte Ceramics, Timber and Concrete with Exposed Aggregate

Fig 153: Model Ten - Combination of Natural Timber Sitting in Glossy Ceramics
Exploration 3.2:

After reflection of the previous material exploration, three models have been selected for further investigation. This exploration focuses on the combination of materials in relation to defining function within a space. Each model is designed from a selected material combination model, using the materials which have been used. The Spatial models focus on the exploration of an exhibition space, with the design inspired by the composition of the selected model. The exhibition spaces also look at how lighting techniques can be used to illuminate the ceramic object. The use of digital tools allows for a more realistic understanding of how the space functions and is illuminated.
Fig 157: Exhibition Space 2 at 10 am. Based From Exploration 3.1 Model Two

Fig 158: Exhibition Space 2 at 12 pm. Based From Exploration 3.1 Model Two

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Design Exploration Review 3:

These design explorations are used to develop an understanding of materials and how they can be experienced in architectural design. The initial design exploration of the material combinations defines the material palette of the design; the material selection based on research and local context. These material models enable the investigation of materials and how they relate to one another. The issue with these investigation models of materials is that they are based on their being placed next to each other. This can show how they can work with one another at a relative scale but when they are used in architecture they will be used in different scales. Materials may work together at one scale, but if one of them is then used at a different scale then the material combination might not work as well.

The second exploration is used to develop an understanding of materials and their use for spatial definition; how materials can divide two separate functions. The spatial models are used to develop the exhibition spaces, indicating ways to divide space into separate exhibition spaces and transitional spaces. The use of digital media allows for fast explorations with materials at a relative proportion with one another. It also allows for lighting studies investigating how specific lighting techniques can be used to illuminate 3D ceramic exhibits, and how the materials react to varying levels of light. From the results of these models the next step is to understand spatial definition and how it can be achieved by using materials which have been selected to use in relation to the research. How can the uses of timber, stone and earth, as primary materials, be used to create a cohesive design, appropriate use of space and circulation patterns?
Conclusion:

The intent for this project is to explore aspects of Japanese architecture. This involves the investigation of light and shadow through natural lighting, the expression of structure through tectonics and the exploration of materials and spatial definition. The study focuses on these three elements based on Japanese concepts and their architectural applications. The research results in the development of new and enriching ideas which can be applied to architectural design in New Zealand.

The designated approach to this design process is to select three elements commonly seen in Japanese architecture which are compatible with the New Zealand context. These three elements are researched and investigated individually in relation to Japanese concepts and architectural application. The investigation focuses on the individual aspects and develops design iterations/experiments which result in greater understanding of the architectural applications. The development of an architectural outcome is used to investigate the findings and how they can be used in a design outcome in relation to a selected programme and site. For each researched characteristic, a design exploration and architectural outcome is used to investigate its applications, with each application building on the another. By approaching the project in this manor, you get an in-depth understanding of each element and how they are used in an architectural situation individually. By focusing on one aspect at a time you can see a clear design progression, slowly building up the project and enriching the architectural outcome by adding layers to the design focus for each design exploration. The issue with this method of design is that the design process is slow and incoherent until all selected elements have been researched. During the design process, the focus is on the primary element of focus rather than all three elements at the same time which results in coherent individual applications of the research but not an in-depth understanding of the combined applications of all areas of research until later in the design project.
Due to the nature of the research project, an architectural outcome is required which builds on the developed field of knowledge. The project is the design of a ceramic museum that serves as a case study demonstrating the findings of the research. As mentioned earlier each design phase focuses on an individual characteristic and is used as an exploration of their architectural applications. Design iterations are used to conduct explorations of Japanese techniques in relation to the selected characteristic. The design of a museum is used to explore various adaptive techniques, allowing for easy critique and refinement in relation to the selected elements. Digital media is used to produce a lot of work fast which can be critiqued and refined. Approaching the design in this manner allows for fast production of material but results in the designs being incoherent and hard to understand in terms of function and spatial organisation.

The three aspects which have been studied have been selected for their applicability to all building typologies, the design demonstrates these aspects in the context of a museum. The applications of the concepts will vary with site context and design approach. Therefore, it is important to understand the concepts derived from Japanese culture, and understanding this allows for variation in design approach.

To be able to adapt characteristics from one culture in another, it is necessary to understand the origins of the development of the concepts. The origins being the contextual, climatic and cultural conditions and values which lead to the development of the concepts and ideas which effect the architectural applications related to the characteristics. Once identifying the key concepts and their origins, it is possible to successfully adapt them into another culture. The project demonstrates that, with a deeper understanding of the origins and intent of specific design characteristics in one culture, they can be successfully adapted to another for the enrichment of architectural design.
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Fig 173: Final Presentation Circulation Diagram.

Circulation Routes.

Fig 174: Final Presentation Section and View Locations.

Location of Sections and Views.
Fig 175: Final Presentation Exploded Axonometric.
Fig 176: Final Presentation Section AA.
Fig 177: Final Presentation Section BB.
Declaration

Name of candidate: Ethan Patfield

This Thesis/Dissertation/Research Project entitled: Kintsukuroi

is submitted in partial fulfillment for the requirements for the Unitec degree of Master of Architecture Professional

Principal Supervisor: Kerry Francis

Associate Supervisor(s): Cam Moore

CANDIDATE'S DECLARATION

I confirm that:

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Research Ethics Committee Approval Number: NA

Candidate Signature: ___________________________ Date: 11, Oct, 2017

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Full title of thesis/dissertation/research project ('the work'):
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Practice Pathway: Architecture
Degree: Master of Architecture Professional
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