Castle On Edge

Adaptive reuse of Cargill’s Castle and its site

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An explanatory document submitted in partial fulfillment of the requirements of the degree for Master of Architecture (Professional) at Unitec, New Zealand 2019

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Abstract:

Over the years, a heritage building can be disregarded and over time become derelict. The re-purposing of a building is the perfect soil, whereupon new creative ideas produce spaces that are a unique response to a specific cultural and historical location.

The adaptive reuse of a building allows for different levels of interventions, which can be minor or essential to the fabric of a new design programme. Proposals to change heritage sites tend to be considered by the community with a certain level of concern, as they embody their history and culture; these proposed interventions aim to respect and celebrate the cultural heritage of the city while giving a new life to the local heritage site.

Cargill’s Castle on Dunedin’s coastal cliff, south-east of the city, is the selected site for this adaptive reuse project. Today the abandoned building has no programme or function; it is a derelict structure on the edge of the cliff. The adaptive reuse takes into consideration the social, historical and geographical aspects, which direct it towards the best design response. At the same time, the preservation of surviving original elements is considered essential to retain the cultural heritage of the building.

Modern and 19th-century writings on conservation and restoration of historic buildings are analysed and studied to direct the project towards the most suitable restoration outcome.
Acknowledgments

The completion of this project research would have been impossible without the support and encouragement received day by day from the people around me.

A warm thank you to Graeme McConchie, my supervisor, who guided me toward the completion of the project, and to Renata Jadresin Milic, who helped me to find new solutions.

I am grateful to my family, who supported me in the moments of stress and helped me to carry on towards the finish line. Most of all, thank you to Brie Murdoch, my girlfriend, who made all the hard times seem easier by looking after me and encouraging me during the months of research.

All the support shown will always be cherished and remembered.
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Introduction

Research Question

‘How can adaptive reuse in architecture restore life to a forgotten heritage building to satisfy the needs of the community?’

Project Outline

This project offers a response to the social concerns of a local community, respecting the heritage and history of the area with the adaptive reuse of a derelict building.

Focusing on Cargill’s Castle, built in Dunedin in 1877, the building nowadays has no connection with present society; it is on the verge of being almost forgotten. A local politician built the Castle and the construction cost was £14,000, which at the time was a vast sum. The location of Cargill’s Castle is on the picturesque white cliffs of Dunedin, with a magnificent view of the Southern Ocean.

The Castle was once a proud piece of colonial Dunedin architecture, yet today it stands in ruins; its interior is lost, and the exterior is in a state of abandon. The Italianesque style of the structure suggests how the building once was a symbol of colonial wealth and power. Today, the structure has no function, no belonging, but the community of Dunedin has not entirely forgotten its presence.

The structure and the history of the building ‘scream’ for a place in today’s modern world. The shell of the building needs to be strengthened by engineering work for it to safely reopened as a tourist attraction, with on-site boutique accommodation, areas dedicated for private functions and an area to exhibit locally made goods. The history of the Castle makes it a perfect location for answering a few deficiencies that Dunedin has regarding tourist accommodation and entertainment.

Aims and Objectives

The vintage 19th-century structure can be blended with today’s technological modernity, creating a location that could be a perfect example of a saved and repurposed heritage building. The newly repaired Cargill’s Castle, with its additional structures, aims to activate a design programme that brings the local community and visitors to the site in a unique location where Dunedin heritage and restoration projects can be celebrated and admired.

The aim of the project is to revitalise the structure of the building with the use of modern materials. A compelling design is created by combining old and new Italianesque and modern styles and enabling hybrid functionality. This gives to New Zealand’s southern city of Dunedin a social hub that it is currently lacking.

Scope and Limitations

The project is guided by the NZ ICOMOS Charter of 2010, to ensure that the history and heritage value of the older structure is taken into account. The revitalisation of Cargill’s Castle aims to have a positive influence into the city of Dunedin: attracting tourists, showcasing a cultural location with a museum within its walls, as well as creating revenue for the community and providing a place for both public and private functions. Although the project includes a proposal for hotel-style accommodation in its programme, the design focus is on the Castle and its repurposing.
Key Terminology

- **Restoration** - “the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period.”

- **Preservation** - “the act or process of applying measures necessary to sustain the existing form, integrity, and materials of a historic property”.

- **Conservation** - “the process of maintaining and managing change to a heritage asset in a way that sustains and where appropriate enhances its significance.”

- **Italianesque** - “Italian in style or character”.

- **Stabilising** - “stabilisation work consists of various kinds of repair from re-grouting walls, to completely re-building them when necessary.”

- **Repair** - “Restoration of a broken, damaged property to an acceptable operating or usable condition or state. See also beyond economic repair, major repair, normal repair, and repairability.”

- **Assembly** - “An assemblage is the increase in the dimensions of a multiplicity that necessarily changes in nature as it expands its connections.”

- **Reconstruction** - “The act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.”

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State of Knowledge in the Field

When talking about how to protect heritage places within New Zealand, it is advisable to follow guideline documents such as The Venice Charter 1964 because it offers guidelines for the communities and organisations that wish to be involved in the conservation and restoration of New Zealand’s cultural and historic sites. This document breaks down into a simple format the procedure to follow when a heritage building needs restoration. The analysis and studies of the structure have to be thorough to pinpoint exactly what type of heritage building the project is dealing with, and the design approach it needs to undertake.  

Egypt, for example, has an enormous history, which was neglected throughout the 19th and 20th centuries. The nation’s heritage monuments dating back to the Pharaonic era were damaged and became ruins. Professor Mohga E. Embaby (Department of Architecture, University of Fayoum) explained how it is essential to create awareness through education because, in earlier years, the knowledge of the Egyptian heritage was not valued and protected, due to the lack of teaching methods at tertiary level. The awareness of the need to protect Egyptian heritage sites was achieved by implementing new teaching methods that made students aware of the importance of protecting their heritage.

To create an international understanding of how to protect heritage sites and buildings, the ICOMOS (International Council on Monuments and Sites) organisation has published charters for experts in the field to follow in order to preserve heritage places from degradation globally.

The second edition of the ICOMOS Madrid Document was released in 2014 to create awareness that too many of the 20th-century sites are not being adequately looked after by experts in the field and are “threatened by the lack of appreciation and recognition.”

Cultural significance is a vital point covered by the Madrid Document. It declares that the cultural significance of an area cannot be maintained through a sharp moment of transition; it is crucial to manage and guide the change of use. The latter can be achieved through the acknowledgment that through time, the purpose of an area changes. The transition should not be sudden but composed and guided so as to reduce “adverse impact.”

UNESCO, on the other hand, puts the professional ‘in the stand’ to make a different point: today’s professionals have the duty to preserve, but also to create future heritage places, placing the matter on a social plane. It affirms that any culture could not exist without the heritage that has been passed from generation to generation, and how the heritage buildings and places play a role in the formation of national identity.

To further understand the perfect restoration outcome needed for Cargill’s Castle, it is essential to analyse the theoretical restoration project located in Dunedin. The design outcome must take account of the most appropriate restoration method to adapt to this project.


Methodology

The method of approach to Cargill’s Castle needs to be tested by exploring various options. As the building dates back to the 1800s, there are no records of the building plans. The structural integrity of the building has to be studied as the damage to the building looks severe.

The building can be strengthened and possible additions can be made, but the question is how? In particular, what material should be used? What style should be chosen? Will the restoration project reach an acceptable solution? These questions are answered by proceeding with a site visit in order to collect data by taking measurements and pictures, which later are used to produce a 3D model.

The materials and styles chosen in the project need to be trialled to have a better understanding of the possible combination of materials. This methodology of trial and error will involve discarding unwanted options and pointing the research toward a more successful outcome.
Cargill’s Castle

Introduction

Brief History of Dunedin and the Gold Rush Era

Between 1853 and 1870, New Zealand was going through some major events that saw the number of immigrants dramatically increase. The first was the New Zealand Wars, which brought into the country large numbers of soldiers and military settlers; and the second was the discovery of gold in the Otago region, taking the population of non-Māori New Zealanders from 27,000 in 1851 to 255,000 in 1870 (see Fig. 1).15

The discovery of gold made a significant impact on the Otago region; as the colony was struggling to establish itself, the wealth generated brought the possibility of establishing a solid foundation for families and communities. Miners and workers from all over the world rushed into Otago to seek their fortune, creating a multicultural community in which could be found Irish, Germans, French, Italian, Chinese, Jewish, Scottish and English immigrants.16

Gold was discovered first in 1861 by Gabriel Read, in what is today called Gabriel’s Gully. With the use of a pan and butcher’s knife, he managed to collect 200 grams of gold in only 10 hours; it was not long before the word spread, and miners from all over the world rushed into the valley to collect the precious metal, and in 1862 as many as 30 kilograms of solid gold were collected. In 1863, miners and workers settled in Gabriel’s Gully and surroundings rivers. Water from the rivers was redirected to flush the ground and loosen it. But water in the region was scarce, and the miners regularly had no running water to carry on mining.

Due to the harsh environment, the mining activity came to a sudden stop in the 1870s.

In the 1880s, a couple of companies continued to mine in the area, but the gold rush era was coming to an end. During the Great Depression of the 1930s mining activities started again with more modern technologies; this continued until 1969 when the last mining company shut down, ending 100 years of gold mining in the area.17

Influences from all over the world were felt in Otago during the gold rush. These shaped the look of the city of Dunedin.

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15 NZ GOVT, *The Provincial and Gold-rush Years, 1853-70*, PDF, Wellington: NZ HISTORY.
William Cargill

The Cargill family was central to the founding of Dunedin. Originally, the Cargill family came from Edinburgh in Scotland. In 1845, William Walter Cargill (see Fig. 2), whose son Edward Cargill subsequently built Cargill’s Castle, led the plan to emigrate to New Zealand to establish in Otago a pre-industrial settlement for the Free Church of Scotland. In 1848, the settlers arrived and established Dunedin at the entrance to Otago harbour. Some years later, William Cargill came to dominate the political aspect of the province of Otago, helping Dunedin to achieve a modest success as a colonial destination (such that the city of Invercargill was named in his honour).  

In the first five years of Dunedin’s life, William Cargill proved to be the right man to bring the city to its feet. First, the settlers’ work involved struggling against the harsh weather and absence of road and pastures for the cattle; the second aspect to keeping the young city alive, was to deal with the isolation of the settlement, especially after 1851, when the New Zealand Company support for the settlement was withdrawn. In 1853, William Cargill, with the support of the community, was voted superintendent of the Otago province. His style in his role was very autocratic and patriarchal. The superintendent’s intention was to fight for the autonomy of Otago. He was a man intolerant of criticism, especially that which appeared in the Otago press. Cargill unashamedly promoted his son and son-in-law into politics. He tried to keep the price of land high to discourage the larger companies from buying large pieces of land, but in 1856 there was a financial crisis and the price of land had to be lowered. His actions played a part in Southland splitting off from Otago in 1861.

Even though William Cargill was a very autocratic man, he was crucial to the survival of early Dunedin. Where many settlements had failed, Dunedin was a city with its own political structure, and settlers were improving their life positions. William Cargill died on 6 August 1860, just before the gold rush began.

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Architect: Francis W. Petre (Lord of Concrete)

Francis W. Petre (see Fig. 3) was one of the most influential architects in early New Zealand. He was born in Petone on 27 August 1874 into one of the most influential Catholic families in Colonial England. In 1855 he returned to his family in England, where he completed his studies at Ushaw College in 1869. He started work as an engineer and shipbuilder before working for Daniel Cubitt Nicholls as an architect. This work experience gave him an understanding of the newest engineering techniques and the use of new materials, such as concrete.

In 1872, Petre returned to New Zealand because he was employed by an engineering company to supervise the railway construction in the South Island. In 1875, he opened a practice in Dunedin where he spent the rest of his career. Petre married the daughter of Edward Cargill in 1872. In 1877, he designed Cargill’s Castle for Edward Cargill.20

In 1877, Petre was assigned his first important commission in Dunedin, which was St Dominic’s Priory where work began in 1877. Today, the St Dominic’s Priory is a Dunedin Heritage listed building; after a decade of negligence the building is under restoration, thanks to $588,000 donated by 20 different trusts around New Zealand.21

Petre’s engineering skills and adoption of new material, such as reinforced concrete, made him stand out; thus, he was assigned more projects, such as the Sacred Heart Church in Dunedin in 1891. With the growth of the Catholic Church, Francis W. Petre’s office expanded as more contracts were assigned.

In the following years, Petre worked on various New Zealand churches, such as the Basilica of the Sacred Heart of Wellington in 1899 and the churches in Timaru and Waimate in 1910 and 1913 respectively. His biggest contract was for the Blessed Sacrament Cathedral (see Fig. 4) in Christchurch built between 1901 and 1905.22

Petre also designed houses. As one of the first pioneers in the use of reinforced concrete, he was given the name “Lord of Concrete”. One of his few residential buildings built in New Zealand was Cargill’s Castle, commissioned to him by his father-in-law. Because of his skills in engineering and architecture. Petre became an active member of the Dunedin Institute of Civil Engineers and Architects in 1876. He was a popular member among his peers, and after the death of his father-in-law he became the consular agent between Italy and Dunedin. Nineteenth-century Dunedin had its own Italian consulate, where Petre was an honorary member; over the course of his life, he developed a bond with Italy and the Italian culture, an influence that he expressed in his construction and design. Francis W. Petre’s love for Italy should be celebrated in the restoration of Cargill’s Castle.23

His long career granted him the honour of being one of the first New Zealand-born architects to be part of the NZIA. He died in Dunedin in 1933. Petre is remembered as an innovator in the use of concrete and finding novel engineering solutions for his time.24


Urban Context

Dunedin Walks

Modern Dunedin has a range of entertaining factors which at present attract tourists. Two of these are the heritage walks advertised by the City Council to showcase the history of Dunedin. They are simply called: “Walk One” (see Fig. 5), which showcases the first settlement in historic Dunedin dating back to 1864; and “Walk Two” (see Fig. 6), which showcases other heritage buildings and the University Campus in the northern part of Dunedin.25

On these two walks, you can see the pioneer character of the city. Arranged in one area are masonry buildings, which are rarely found in New Zealand. These buildings vary in styles, from Italianesque and Victorian, to Edwardian style buildings. This variety stems from the high number of European pioneers who came to the Dunedin region in its early stages and creates a very European feel to the city.26

Figure 7: Location of historic building in Dunedin
Historic Buildings

The Roman Classical style, which was ‘trendy’ in the 1800s building designs, is visible in Cargill’s Castle’s.\(^{27}\) It can be seen, too, in a few important buildings of the city, such as the Old National Bank Building (see Fig. 7, no. 9). (For more 19th century Dunedin buildings, see Appendix 3)

The Old National Bank Building in Dunedin was built in 1882 and was the former commercial heart of Dunedin. The building was designed by architect William Barnett Armson and considered his masterpiece.\(^{28}\) As typically found in Italianesque design, symmetry is the key to a classical design (see Fig. 8). The windows are perfectly aligned, and the door placed at the centre is adorned with a highly decorated arch to distinguish the main entrance. We can see two kinds of pilasters used on the building: the Corinthian at the top; and the Doric at the bottom. A thick, strong foundation is at the bottom to hold up the enormous weight of the building. Horizontally, the parapets on the first floor and on the top of the building run parallel to each other. This type of design is usually found in institutional or government buildings around the world.

This building shares with Cargill’s Castle the detailed classical cornice. The cornice of the Old National Bank, is more detailed and has a sharper detail, which celebrates the craftsmanship. Cargill’s Castle has lost this kind of detail, once celebrated in the windows, doors and cornice of the building.

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On the Old National Bank building, the lion appears often on the building as a symbol of strength and power (and is visible on other buildings in Dunedin). Figure 9 shows the lions on the main door of the building, and Figure 10 provides an example of how lions are visible under every window on the building’s façade.

The inside of the bank has a highly detailed ceiling in a renaissance style with flowers and leaves to celebrate nature. The symbol of the cross is repeated often, which is not part of the renaissance style but more of English origin because the first pioneers were mainly Christian.
Cityscape
Walking around Dunedin, different types of colonial styles emerge from every corner.

Figure.12: Dunedin cityscape residence 1.

Figure.13: Dunedin cityscape residence 2.
In city centre, there are residences with a very distinctive ‘castle’ form and Italianesque decorations (see Fig. 12 and Fig. 13). The mixing of cultures that occurred in Dunedin in the late 1800s resulted in mixed styles and construction methods of the city. The cityscape is one where Victorian styles, different colonial styles, and Māori decorations have all been mixed together into a variety of house designs. The different styles and characters of the houses of Dunedin make the city unique distinguishing it from every other city in New Zealand. It is noticeable when walking around the town that the city has been trying to keep this mixed character of decoration.

Along the streets of Dunedin, the ceilings of the verandahs above the footpaths are highly decorated and have been maintained in an old-style, unlike other cities that have moved to a more modern approach. Such decoration, in the form of the lions mentioned previously (see Fig. 14) is also visible above the verandahs; this is a feature commonly seen in old European cities but not often in New Zealand.
Site

Cargill’s Castle is in South Dunedin, on the promontory overlooking the sea (see Fig. 15). The Castle sits close to the edge of the cliff, from which there is a unique ocean view. The new design has to integrate the surrounding environment, such as the white cliffs, to elevate the quality of the design outcome (see Fig. 16).

Over the years, Cargill’s Castle has had many functions. Its original purpose was to be the mansion for the Cargill family. In the past, Cargill’s Castle had 21 rooms, and the site accommodated stables, a man’s quarters, a coach house, tomato houses, a gardener’s cottage and acres of paddocks. In 1892, a fire ruined the interior of the building, and until 1929 the structure was unsuitable to be used as a dwelling. In 1930, John Hutton bought and refurbished the Castle. He turned it into a restaurant and cabaret, which ran until the 1950s.29

In its time, Cargill’s Castle has had many owners, but none of them managed to stop its unfortunate descent into ruin (see Fig. 18). In 1996, the Castle’s ballroom was demolished and, not long after, the site was purchased by the newly formed Cargill’s Castle Trust.30

Today, the Castle can only be admired from afar because the property is fenced to protect it from vandals and, in any case, the structure is unsafe to visit. In the past, there was a trail from the Castle to the Beach tunnel, 20 minutes’ walk south down the cliff (see Fig. 17). The tunnel was dug by the Cargill family after the construction of the mansion. Now, through a different path, hikers can reach the tunnel that runs down inside the cliff to the lower beach.31

Cargill’s Castle Trust is engaging with the public to raise money to repair the main structural damage to the building. The Trust has raised enough money to be able to fence the building, and engineers are currently drawing plans to strengthen the structure. Dunedin City Council has shown its support by purchasing the land leading to the Castle, allowing in the future for people to hike from the city to the Castle. This is testimony that the local community wants to see the Castle survive and become an attraction for domestic and international tourists.

In 2015, Neil Oliver, host of a popular BBC documentary, came to Dunedin to explore the coastal landmarks of the region (see Fig. 19). This resulted in a series on New Zealand that would have been seen in 30 to 40 countries.\footnote{John Lewis, \textit{BBC Doco a Big Boost for Dunedin}, Otago Daily Times Online News, March 26, 2015, accessed October 08, 2018, \url{https://www.odt.co.nz/news/dunedin/bbc-doco-big-boost-dunedin}.}
Figure 20: Photograph Cargill's Castle 1870
The Castle

Gate

The Castle is positioned on the top of the cliff. (see Fig. 21). On foot, the walk from the cliff road to the Castle is approximately 10 minutes on a gravel road. As soon as you get closer to the Castle, you can find the original location of the gate.

As of today, it stands alone in the landscape. Upon entering the site, the Castle starts to appear from behind a security fence (see Fig. 22). This has been erected due to repeated trespassing by tourists, locals and vandals, who in the past have endangered themselves by visiting Cargill’s Castle or damaged the building and its surrounds. Steven De Graaf, the president of Cargill’s Castle Trust, allowed the visit to the Castle and explained the future plans for Cargill’s Castle (see Fig. 23).
Figure 23: Reference plan for site analysis
Conditions Analysis

The Castle was built with concrete mixed and poured on-site. The use of concrete in 1877 was an advanced method of construction and was one of the first times that concrete was used for residential purposes. Architect Francis W. Petre was the pioneer that brought the use of this new technology to New Zealand, and would later be used for many of his projects such as churches and cathedrals around New Zealand. Due to the lack of experimentation with concrete, the architect and builders made the mistake of incorporating larger stones into the concrete, creating weaker points in many parts of the structure. This mistake was probably caused by the early masonry method of construction which was inherited from the Europeans.

By assessing the structure from the outside, the severity of the damage to the Castle becomes evident. The parapet on the north facing part of the Castle has been partially destroyed. The windows and doors have long been removed, exposing the building to the elements. Through window openings, it is possible to see the original wooden structure of the roof, which is also exposed to the elements.

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When examining the tower (see Fig. 25), damage resulting from the Castle’s abandonment is apparent. Some of the Italianesque decoration below the parapet is still present, except at the top right side of the tower; here, during a storm, a large chunk of the decoration and structure had fallen on to the wall below and partly breaking that wall (see Fig. 26). The top window has lost the original concrete division. Weather has damaged the other two window openings. Rain and wind corrosion have exposed the previous colours and the original material of the structure, as well as the methods of construction of the building. By walking towards the west side of the structure, it becomes clear that the site is not a safe place to linger for long as pieces of the structure could fall.

The sand stone wall (see Fig. 27) is not part of the original structure; it was built in the 1940s36, and shows how this part was built. This section was the garage, and before that it was the coach house. It was built with wood, corrugated iron for the roof, and concrete for the walls and floors. Behind the garage, an unusual method of construction is visible, one that is not often found in New Zealand. The back wall of the old garage was constructed from sandstone, cut into a rectangular shape, stuck together, and held in place by timber studs. Incredibly the wall is still standing, as it is noticeable how the sandstone can only be held in place by the timber studs (see Fig. 26).

West Side

The building is severely damaged: some of the original walls of the Castle have collapsed and only the outline of the walls is visible as they protrude from the ground. The surviving walls that are still standing have large cracks that run through the structure and connect through the window openings, which are the weaker points of the structure (see Fig. 28). Figure 29 contains a photograph of the top right side of the west face, and from this the unstable state of the structure is visible.

Figure 29: West side cracks
Carrying the exterior inspection on to the southern side, it is evident that this is the most exposed to the perils of rain, wind and ocean. It is possible to see that large parts of the original parapet are breaking off. In addition, cracks are beginning to form, starting from the top and travelling down toward the bottom of the structure (see Fig. 30). This part of the building’s walls has a high percentage of voids, which make the stress of the weight larger on the smaller parts of the concrete. This makes the structure even more unstable.

The winds on this side are particularly strong, making their corrosion faster and more visible on the surface of the wall. Cracks are a constant presence on the surface of the Castle, and a reminder of the fragility of these ruins.

Figure 30: South side window frame

Figure 31: South side cracks on surface
East Side

The building is the least affected by the weather, standing where the ballroom once was. Demolition ordered by the city council, which should have included Cargill’s Castle too, was stopped by the Trust. Since then, everything has been left as it was. In the adjacent room, the roof and ceiling are completely lost, the walls have disappeared, and vegetation now grows in the building, revealing how nature can easily regain its ground (see Fig. 32).

Figure 32: East side broken walls

The entryway (see Fig. 33) shows pieces of the original plaster, which are falling from the walls, and brings you to the main entrance, which before had a large door and a half-moon highlight. Where only small parts of the existing hallway flooring structure remain, it is possible to see where the first floor once was. On the verandah (see Fig. 34), the window openings have collapsed, damaged by the cracks which run from the ceiling, down to the floor. Ivy is growing inside and is damaging the plaster and structure with its roots.

Figure.33: Castle entryway

Figure.34: Verandah on left side of entrance
Atrium

The entrance atrium (see Fig. 35) has a large opening in the floor, revealing the method of construction of Cargill’s Castle. The collapsed floor shows how the architect attempted to use reinforcement in his design. Through the opening, it is also possible to analyse the concrete foundations of the building, which are still intact.

On the wall are the last pieces of timber wall cladding, which are hanging on to the side so allowing us to see the position of where the old stairs were.

The first floor is also visible, which separated the height of the, now open, interior spaces.

The original timber floor structure is lost, and the first floor is not accessible. Cracks are starting to appear on the inside, as the archways start to be affected by the open environment. The timber roof structure is badly damaged; it is unsafe because the wood is rotting away. (see Fig. 36)

Figure.35: Entrance atrium collapsed floor

Figure.36: Atrium wall surfaces
To the right of the atrium, it is possible to see where the first stair landing once was (see Fig. 37). As the west side of the Castle is 1.5 meters lower than the centre and east side, intermediate floors were created on the west side and the tower. This provided space to have different stair landings, which would have taken the residents to different parts of the building. Large cracks are appearing in the walls and openings. Figure 37 shows how once the occupants would have moved from one floor to another, and how the Castle’s height is relevant, allowing for multiple floors inside.
On the east side, the damage to the building is in an advanced state. The timber floor has collapsed (see Fig. 38), making it impracticable and unsafe, but again it is evident that the Castle once had a cellar or room in its foundation, maybe for the preservation of food or storage of utensils. The roof structure is lost; there are no traces of it, as it could have collapsed on the floor below. The walls structure made of poured concrete is revealed, and it is apparent how ‘chunky’ the rocks are; these larger rocks are one of the reasons why cracks appear in the entire structure.
Directly off from the atrium, there are two rooms that look towards the south to where the cliff is located (see Fig. 39 and Fig. 40). The walls reveal that larger rocks were used in the concrete mixture because they are breaking off from the wall. In today’s mixtures, such large rocks are not allowed to be used. The floor is concaving under its weight, and in some parts has collapsed, revealing the construction method used in the hallway was carried out on most of the Castle’s flooring. All the wall surfaces are badly damaged, and in this room, the original timber flooring structure of the first floor is visible.

The ocean is visible through the windows, (it is only visible from the south side of the building). To the right, there is an opening which connects the two rooms. The adjacent room has been damaged more severely; the timber structure of the first floor has collapsed over the concrete floor, breaking it and creating a hole in the floor below.
The harshness of the environment has rotted all the materials. Aggressive corrosion is visible by examining what remains of the steel beam which holds an entire piece of the concrete wall; the middle of the steel is reduced to a small rusted steel rod (see Fig. 41). The opening in the floor (see Fig. 42 and 43) shows again the concrete foundations and how thin the reinforced steel was; this strengthening of the concrete was not enough to withstand the weight of the wooden floor falling from above. The south room shows access to the old kitchen, but the stairs have disappeared and the only access is through the atrium.

Figure 41: Steel beam rusted away
Figure 42: Windows frame
Figure 43: Reinforced concrete floor
The kitchen is lower than any other part of the house. Because heat would have travelled up to the other rooms, some of the flooring structure of the floors above is still present, but mostly has collapsed. (see Fig. 44 and 47)

In the fireplace, some of the original tiling work is visible, (see Fig. 45) and in the fireplaces in every room above. Part of the roof has survived, but it is not safe, nor will it survive there much longer, as pieces move and swing with the winds.
From the kitchen, the tower can be accessed with a door opening on the right side at the bottom of the stairs (see Fig. 46). The tower is the only place where the ceiling is still present, allowing the timber floor structure to survive a little longer. The ceiling is damaged; large cracks are visible and will eventually collapse, taking down all the structures below. (see Fig. 49)

The fireplace in figure 48 is covered with dirt, as its interior continues to deteriorate. There are fewer cracks in this part of the structure because the roof is still partially protecting the fabric of the building from the action of water and wind. The use of the rooms in the tower is not known; there are neither pictures nor any other evidence of what they once were.
Figure 51 shows stones with a diameter of around 200mm, have been used as part of the concrete on-site pour. These stones are weakening the structure of the building because when they fall off the structure, their void is more significant, and their surface detaches more easily from the concrete. Over time, the stone expands and contracts with the heat and cold, losing its firmness with the existing aggregate.

It is also evident that the ratio of stones to concrete was not correct, as is visible in the opening in the wall (see Fig. 50). The percentage of stones is larger than that of the concrete, which creates large pockets of air in the wall fabric; this allows water and moisture to run through it, which will eventually weaken and damage the structure (for more historical photographs of the Castle see Appendix 3).

Literature Review

This section reviews a range of literature on the theory of conservation and adaptive reuse applied to historical buildings. These theoretical approaches, together with the analysis of the practical experience drawn from the selected precedents studies, provides direction and rules for the restoration of Cargill's Castle.
Conservation Theory and Practice

The ICOMOS NZ Charter guides professionals through the journey of restoration and revitalisation of a site by allowing for the new design to pay respect to the old structure and to balance the use of old and new techniques of construction.39

The revitalisation of Cargill’s Castle, using modern materials and design, can revitalise the function of the site, giving it a new life which can be achieved with mixed functionality. The design intervention, however, needs to complement the original structure, not cover it; the latter would represent a disregard for the history of the building. Furthermore, the ICOMOS NZ Charter insists on extensive research into the history of the building, to inform recording and planning, before any restoration job is undertaken on a heritage building. Furthermore, the Charter lists the range of interventions to best preserve the heritage value of the building:

- preservation by stabilisation and repair
- restoration by reassembly or removal
- reconstruction
- adaptation40

Nick Evans, in his book *An Introduction to Architectural Conservation*, issues a warning to anyone that wants to take on a restoration project. He says that covering a building with new materials alters its character and, therefore, cancels its history. This is, effectively, the same results as demolishing the structure and building a new one; the integrity of the building needs to be maintained.41

Regarding Cargill’s Castle, it is important not to make the mistake of covering the old structure with new materials, but to show the exposed concrete of Cargill’s Castle’s wall to respect the history and the character that Nick Evans emphasised.

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In the U.K. in the 19th century, William Morris published a manifesto which became a guideline on conservation work. In the industrialised era of the time, where the old was being destroyed or covered, he stopped the fast renovation trend by raising the idea of repair not restoration by renewal. This manifesto was published by the SPAB (Society for the Protection of Ancient Buildings), a professional group that William Morris was part of. The manifesto advanced the ideas of making the new fit in the old; that is, repairing and maintaining the historic structures instead of demolishing them.42

In Cargill’s Castle, the idea of maintaining was not followed, and the Castle became a ruin. Nevertheless, the repairs on the structure can be done and the walls’ cracks filled with new material to strengthen them. But, after the consolidation of the original structure is done, it is important to build within the constraints of the original walls.

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Adaptive Reuse

In 1983, the English Heritage Guidelines were established, to protect the U.K.’s national treasures and be preserved for future generations. The organisation published, in 2008, subsequent guidelines entitled *Conservation Principles and Guidelines for the Sustainable Management of the Historic Environment*. Here, the guiding principles are that no one owns the historic environment it is public and anyone can participate in its protection; importantly, though, the historical environment needs to be managed and maintained. English Heritage (once Historic Buildings and Monuments Commission for England) does accept the changes in the historic environment over time, and that these environments require constant adaptation in order to keep them from becoming unused.43 Cargill’s Castle’s change of programme from a residential house to a mixed use area is essential to keep the building in an optimum state. The transition of uses is well regarded by the English Heritage guidelines but always with the intent that the change needs to be reasonable, transparent and consistent.

The restoration of Cargill’s Castle follows the heritage guidelines in the abovementioned literature. The design does not try to overtake the original structure: the floors and roof of the new section are reconstructed in the same position as they were before, but without trying to fake the restoration of the original floor. The walls and foundations are the only original structure left of Cargill’s Castle, and they are kept as original as possible by trying to use the less invasive method of reinforcement of the structure.

Previous design projects carried out by Unitec masters students, have encountered buildings that needed revitalisation in the city of Dunedin. Maria Phillips (2013) proposed the transformation of Dunedin’s Old Prison into a boutique hotel because New Zealand’s tourism industry is growing, and there is a lack of accommodation. The adaptive reuse of the prison was done by following the ICOMOS and UNESCO charters, so as to carry out a design outcome that respects the site and its history, as well as satisfying the accommodation needs of the city.44 Alexandra Rean’s (2013) project was an exploration of the revitalisation of the older part of Dunedin’s port. Focused on an urban scale, but similar to the old prison reuse, it aimed to give the port a different use, more oriented towards the local community and the active use of the space. The design methodology of the project focused on the integration of new modern materials which contrasted with the older brick structure. Avoiding imitation of the old, the project introduces, a new modern alteration to the site by way contrast.45

Laura Hughes (2014) tackled the problem of the old empty warehouses in Dunedin. Analysing, after the Christchurch earthquake, how many of these brick buildings are being abandoned due to the vast cost of earthquake strengthening the structure, she proposed adaptive reuse of the heritage Warehouses: giving the large interior spaces a new internal structure and mixed-use.

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43 Alison Henry et al., *Practical Building Conservation* (Farnham: Ashgate, 2015).
The project managed to give to the site a modern interior by keeping the old shell of the warehouses. The methodology used is about mixing new and old in the design outcome, but with less point of contact between new and old such that they are kept separate from one another.⁴⁶

These three projects adopted a similar methodology of restoration, where the original structure was respected and highlighted by the introduction of new elements which accentuate the history of the buildings. They focused on creating new functions without losing focus of the history of the sites, highlighting their past by giving them new meaning.

Aldo Rossi and Eisenman in *L’architettura della Città* talk about the building fabric of the city and how, with time, there are buildings that lose their functionality and purpose. As such, within the fabric of the city these buildings can become a large, unseen problem that can occupy a large section of a city. They also talk about how buildings must change their functionality and obtain a new purpose in order to be utilised by the community. History alone cannot make a building one of heritage. It is neither material, nor the design of the space, but how the building is lived and how its presence persists through the lives of the community. They emphasise that it is not easy to change the function of a building, but that the form also decants its function. The individuality of the building is often perceived by the needs of the people, the historical period and the geographical location.⁴⁷

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Precedent Review

Introduction
The following section introduces precedent studies that have been selected for their history, structure and restoration features. The structures that are being presented have been through the same life cycle as Cargill’s Castle. They are all historic buildings, with a strong connection with their community, but somehow, through their life, they became lost, forgotten and in ruins. Until their restoration, the buildings were rebuilt with different approaches to conservation. These various interventions are analysed in their specific cases, taking into consideration the context, culture, size, materials, programme, community connection and the final result of the restoration.

During the course of this research, minor precedents are presented to support the design decisions made to finalise the approach taken for Cargill’s Castle restoration. This analysis narrows down the possible interventions method that is suited for Cargill’s Castle.
Buildings

Astley Castle

Architect: Witherford Watson Mann
Office: WWM Architects
Area: 282 m²
Entities: English Heritage, Landmark Trust.
Client: Mr. S Martin, Mrs. J Wainwright
Construction Cost: £1.25 million
Original Use: Residential
New Use: Hotel
Rating: Four star
Price: £1180
Construction: Completed in 2012
Awards: 2013 RIBA Stirling Prize, Fritz Höger Preis für Backstein-Architektur 2014 (Transformation Category)

Figure 52: Astley Castle Exterior east side 1967

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Astley Castle (see Fig. 52) was built in the 12th century by the Astley family. The mansion was fortified in late 1266, but it was not until the 15th century that the Castle evolved into its latest form. In the 16th century, the Castle was bought from the Astley family by the Newdigate family. The Castle became a secondary home for the Newdigate family. In 1770, additional work added a stable and coach house, and the interior was completely remodelled in the modern style. In the 1950s, the Castle became un-used and it was remodelled into a hotel; but in 1978 a fire broke out, destroying the interior and the structure. It was not until 2007 that the Castle’s restoration took place, and we see the adaptive reuse take place through an incredible renovation and design restoration.49

As with Cargill’s Castle, Astley was in ruins. The structure was in a precarious state with the landscaping invading the interior part of the Castle. The structure was thick, built with clay bricks, which in the 12th century was the material of choice because it was strong and made it easier to erect high structures with thicker walls. The interior has been lost over time; weather and corrosion started to destroy structural parts of the Castle.50

As visible in Figure 53, the exterior and interior of the Castle were not defined, and the original interior timber structure was lost. The community was involved in the renovation of the Castle, and it contributed to the funds needed to restore it. Initially, Astley Castle was not protected by English Heritage until the Landmark Trust and English Heritage backed the project in 2007.51

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The result of the restoration and re-adaptation of the building into the modern realm was a grand success (see Fig. 53 and Fig. 54). The architect, Witherford Watson Mann, was able to achieve the restoration by completely respecting the history and the character of the building, using a similar chromatic scheme between the new and the old materials. The combination of the old rough texture with its old wrinkles and scars, and the perfect young surfaces of the new brick material perfectly joined the structure together. The architect restored the main structure, without altering the look, as the walls were only cleared and washed so left unaltered.

The interior of the Castle has re-established timber as one of the materials. The clear texture of the timber does not create a contrast between the terracotta brick and the pale oak timber. Playing with the threshold is a clear intent of the architect. This involved creating a blend between exterior and interior and intermediate places where one can admire a 9th-century contrast of history in each room. Chromatically, the only contrast is created by the green grass of the landscaping and the blue sky through the open skylight.

Figure 54: Astley Castle restoration

Figure 55: Astley courtyard

The interior features play with modernity to create a relationship between old and new material design (see Fig. 56 and Fig. 57). The restoration project completely respects the ICOMOS charter for restoration of a heritage site, and the local community and the architect’s community gave the building Design Awards for its design, and excellent intervention on a building that without it would have been lost.
Matrera Castle

Architect: Carlos Quevedo
Office: Carquero Arquitectura
Area: 136 m²
Entities: Hispania Nostra
Client: Ubri-Prado S.L.
Construction Cost: unknown
Original Use: Guard Tower
New Use: Landmark
Construction: Completed in 2015
Awards: Architecture + Preservation category at the A+Awards 2016, Popular Choice recognition from a public vote

Figure 58: Ruins of Matrera Castle Spain

Matrera Castle was built in the 9th century by Umar Ibn Hafsun, in the southern part of Spain. The Castle is part of Spanish medieval history, used as a guard tower during the Muslim invasion of Spain. In 1985, it became part of the Spanish Heritage Interest. In 2011, after heavy rain, a section of the Castle collapsed; Spanish Heritage called for a restoration of the ruin before it was lost forever.\textsuperscript{54}
Architect Carlos Quevedo was assigned the job to restore the tower in order to avoid this heritage piece getting damaged beyond a repairable state.

As visible in Figure 59, the ruins of the tower were in a precarious state: the walls and foundation had been badly damaged by the elements over the years. There were only two walls left standing; the rest of the tower was lost entirely. The architects had a big challenge ahead, as they had to restore the tower in the best way possible, because the local community was waiting to see their tower restored.

Carlos Quevedo and his office came up with a radical restoration based on the technique used by archaeologists when restoring vases. When an archaeologist finds that most of the pieces are lost, they construct the remaining part of the piece without imitating the original one, making it clear what is old and what is new while trying to re-establish the original size of the piece (see Fig. 60).\textsuperscript{55}

\textsuperscript{54} Kriston Capps and Kriston Capps, \textit{Did a Makeover Ruin This Ancient Spanish Castle?} CityLab, April 01, 2016, , accessed April 08, 2019, https://www.citylab.com/design/2016/03/how-to-restore-a-castle/476097/.

This technique was then transferred to the tower’s ruins, and the results were controversial. The architect secured the ruins solidly and made them part of the new structure. The chromatic scheme is kept equal, where the modern and the old are visibly distinguishable. The architect did not try to re-establish the original structure of the building; his project consists of only the consolidation of the two walls. Compared to the vase technique of restoration, the architect gave a more modern edge to the structure, especially on the taller section (see Fig. 61).\(^\text{56}\)

This project is particularly relevant because some of the locals and the international community did not accept the Carlos Quevedo’s architectural solution. The heritage building restoration was criticised locally, nationally and internationally; the thin ice on which restoration projects travel was put under stress.

Articles appeared about how the restoration project ruined the site and the original elements of the tower the architect did not respect the heritage site at all, and the local community was not happy with the modern solution to save the 1,000 year old masonry tower. The architect justified his decision by saying that the project did not aim to imitate or restore the old ruins but to use future elements to highlight the masonry work and to respect the old structure of the tower. There were many disagreements over this project, but it won an award as the top choice restoration project.\(^\text{57}\)

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\(^\text{56}\) Crisco, Consolidación De La Torre Del Homenaje Del Castillo De Matrera, Carquero, accessed April 08, 2019, http://www.carquero.com/proyectos/consolidacion-restauracion-del-castillo-matrera-cadiz/.


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Koldinghus Castle

Architect: Inger and Johannes Exner
Area: 4200 m²
Entities: Society for the Protection of Ancient Buildings
Client: Palaces and Properties Agency, Ministry of Finance
Construction Cost: $20 million
Original Use: Imperial Castle
New Use: Museum and Tourist Attraction
Price: Unknown
Awards: EUROPA NOSTRA 1993

Figure.62: Koldinghus Castle ruins

The Castle fell into disuse after a large fire (on 30 March 1808) burnt down most of its wooden structure due to Napoleon’s campaign war that was spreading around Europe. The ruins of the Castle lay there for centuries, becoming famous around northern Europe as a ruin. It was not until the 1970s that a full programme of restoration took place.\(^5\)

The restoration of the Castle was an enormous task. The local community was looking very closely at the restoration project because, firstly, it represents a proud symbol of their past, and secondly, the area of the Castle under restoration was so large. The Castle tower is over 50 metres tall, and the ground floor area alone is approximately 4,200 m². The weather severely damaged the brickwork over a long period; the structure was still strong as the foundation of the medieval Castle is very thick at the bottom.\(^{60}\)

The architects, Inger and Johannes Exner, approached the restoration project as if the Castle was a human being: the Castle got sick, and it needs to be cured. The Castle needed to be restored to its original beauty, but had to take into consideration that the Castle had gone through changes throughout history. These altered sections must be celebrated as they are part of the Castle’s history; none should be covered or cancelled out because this would alter the real appearance of the Castle.\(^{61}\)


The restoration took 20 years, and the result was visible internally and externally. From the outside, the section that had been lost was rebuilt; the new components are of a strong black colour to contrast with the brick section of the building (see Fig. 64). The material is not a modern material like concrete, but a timber cladding to also reflect the local material in the region. Looking to the interior (see Fig. 65), modern geometrics used with a light chromatic scheme contrast the dark atmosphere found in the Castle. The large windows and open space bring light into the Castle; the slim and curved columns are a hard and elegant contrast to the thick, dark walls of the original structure. The architect’s intention was definitely to separate visually and structurally the old and the new identity present in the Castle, with an amazing result of contrast and craftsmanship reflected from both eras.62

The project got an award from Europa Nostra in 1993, which recognised the incredible combination of material used, and excellent design made by the architects Inger and Johannes Exner. 63

The scale of the restoration of Koldinghus Castle was large compared to Cargill’s Castle. Furthermore, the method of the restoration is entirely different from the previous two precedents discussed. The architects decided to use contrasting materials and colours, creating a visual impact of the restoration, with a specific linear division between old and new structures. The architects carried on the contrast inside the Castle, using slimmer timber columns that contrast with the thicker brick walls. This restoration shows how Cargill’s Castle lost section can be celebrated with an eccentric addition and playfulness of clever material combination. The architects of Kaldinghus bravely succeeded in the restoration.

Glass Atrium

Sir John A Macdonald Building

Original Architect: Ernest Barott
Rehabilitating Architect: NORR Architects
Area: 7620 m²
Client: Federal Government of Canada
Construction Cost: $99.5 million
Original Use: Former Bank of Montreal
New Use: Museum, Art & Conference
Construction: 201564

The old Bank of Montreal was built in 1930 (see Fig. 66); the project had to be the showcase that represented Canadian ability and industrial capacity to the world. This was achieved through the craftsmanship of the limestone carvings and ironwork of the doors and windows.

The old bank is considered a heritage building of the city of Montreal.

The structure was old and impractical in terms of supporting the modern daily tasks of the occupants; the structure needed modernisation.

The restoration had to consider the historical aspect of the building, when refurbishing all interiors; and the old bank had to undergo seismic and structural re-enforcement.

The restoration project included the reduction of the footprint of the building by means of installing the green roof with a large variety of native plants; to absorb the water and to isolate the building and reduce energy consumption. LED lights throughout the building and an automated system for cooling and insulating the building were installed to reduce further the energy consumption."65

The modern addition had to respect the heritage history of the building; the glass atrium is a smooth transitional space between the modern and the old and does not overpower the heritage structure (see Fig. 67).

The atrium is predominately composed of glass and thin steel components, making the new section very elegant and bright, contrasting with the masonry work of the heritage structure. The open and bright atrium is a legible space that can easily direct the occupants to a different part of the building.

The Sir John A. Macdonald project, has a relevant connection to Cargill’s Castle restoration because both integrate new materials into a heritage building. The atrium creates a harmonious and transitional space between two structures, allowing natural light to enter the building; brightening the space increases the flow and legibility of the space. Without the light glass structure that divides the two buildings, the transitional space between old and new would be harsh and bold; the glass acts like a mould that can be fitted in-between spaces to ease the marriage between old and new masonry work.

Figure 67: Atrium Sir John A Macdonald building
Greenhouse Café:

ITCHEN GRENHOUSE
Architect: ACGarchitects
Area: 35 m²
Client: Private Client
New Use: Green House
Price: Unknown
Construction: 2011
2015 – WAN Awards Small Projects – Longlisted

This modern greenhouse is in Winchester, U.K (see Fig. 68). The greenhouse has a light steel structure, the tough look of which contrasts with the light features of the glass and timber battens; the structure rests on Portland stone, on which carving details give a three-dimensional look. In the steel structure, there are drains that allow for the water to be channelled down to the ground. The timber has been stained black to contrast with the white stone and clear glass. The automatic louvers system controls the temperature of the greenhouse by opening and closing, depending on the weather.66

This combination of materials, steel, concrete and glass shows how the greenhouse in Cargill’s Castle can be light and elegant, without overpowering or taking away from Cargill’s Castle original structure. This light structure achieves transparency and clearness in the structure, which is the perfect solution to apply on the Castle’s cliff where the panorama has to be uninterrupted.

Langton Greenhouse Café:

Architect: Unknown
Area: Unknown
Client: Unknown
New Use: Greenhouse Cafe
Price: Unknown
Construction: Unknown
Location: Leicestershire , U.K.

This greenhouse café (see Fig. 69) offers customers the opportunity to enjoy a morning coffee surrounded by green plants, whether it is winter or summer. The temperature during the whole year is stable to ensure the exotic plants do not become stressed. The glazed walls and roof allow the natural light into the space unobstructed by the slim steel structure.

The Langton Greenhouse Café offers different kinds of shopping activities on their premises from the gift shop and homeware to the garden centre boutique.

On the ceiling’s steel structure, vines have been grown to stop the glare from the sun during hot summer days.

Figure.69: The Langton Greenhouse and garden centre

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Restaurant Precedent

Le Belvedere La Chambotte

Architect: JLP architect
Area: 450 m²
Client: CCAB Client
New Use: Hotel and Restaurant
Price: €1 million
Construction: 2012

Belvedere la Chambotte (see Fig. 70) shares many similarities with Cargill’s Castle. The location is on high ground on the edge of a cliff, taking full advantage of the uninterrupted view. The restaurant at Cargill’s Castle has to take into consideration many aspects that Belvedere La Chambotte has managed to optimise.

The tall windows and glazing, with slim steel columns are the means of bringing the view into the restaurant; the finishing of the restaurant is high-en.

La Chambotte restaurant also has an outdoor area for the guests, with a slim handrail that runs along the outdoor space.

Figure.70: Belvedere La Chambotte restaurant

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La Chambotte Belvedere Hotel & Restaurant was built in 1882 by a French banker on the cliff of the French Alps (see Fig. 71).

The secluded location made it very hard to build as there was no road to lead to the site. The banker spent all his money on the project, and in 1884, when the structure was completed, the banker went bankrupt.

In 1892, the La Chambotte was sold and the new owners built a road from the restaurant to the town of Chindrieux; the location became popular among the tourist as a hike to do on foot or donkey.

As its popularity grew so did its resources; the road was updated, making it possible to reach the restaurant by car. By the end of the 19th century, international visitors were dining in the restaurant and staying in the hotel.

Recently, the restaurant was refurbished, with works completed in 2015. The restaurant is now part of the heritage of the Savoy history, once the old aristocratic family of the area, and advertised to tourists as a Belvedere spot of the valley of Lac du Bourge.  

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This section analyses the appropriate landscaping style that was selected for Cargill’s Castle.

Francis W. Petre designed Cargill’s Castle with features reminiscent of the typical Italian villa. This connection with Italy came about because he was the councillor for the Italian consulate in Dunedin so he had developed a strong attachment to Italy and the Italian culture.
The Italianesque landscaping is the celebration of that emotional attachment. To best integrate the Italianesque garden in the restoration project, the history and evolution from the Renaissance to modern days have to be analysed to properly introduce the features that bond the landscaping to the structure of Cargill’s Castle.
Introduction

During the Renaissance, in the city of Florence, located in the Tuscan region. The Italian gardens generated in Italy between the 1400s and 1500s. Around this time, people were starting to experiment with new styles, inventions and landscaping. The transition between the medieval period, and the Renaissance was quite dramatic, as intellectuals such as painters, sculptures, architects and artists were starting to focus more on the human body, compared to medieval times where God was the sole divine being and the sole focus of thoughts and theories. Hence, Humanism was becoming central and it was creative people that set in motion the Renaissance movement. Key figures included Michelangelo (1475-1564), Leonardo da Vinci(1452-1519), Raffaello Sanzio (1483-1520), Brunelleschi (1377-1446), Leon Battista Alberti (1404-1472), Giacomo Barozzi da Vignola (1507-1573), Andrea Palladio (1508-1580), Sebastiano Serlio (1475-unknown), Donato Bramante (1444-1514) and many more.70

In the 15th century, the Humanist Renaissance brought forward the great classical pieces of ancient Greece and the Latin world, sparking the rebirth of European culture after the dark ages of the medieval times. The revival of the ancient manuscript made it possible for Marcus Vitruvius Pollio’s ‘10 books on architecture’ to emerge as the perfect description of the Classical style.71

In medieval times, the gardens were always built within the confined spaces of the castles, enclosed and protected. However, in ancient writing, the artists of the Renaissance found testimony to ‘Gardens of Eden’ where the openness and the open panorama was the main focus upon which the garden design had to start.

But over the years, as cultures mixed and the connection between cultures increased, the Italianesque garden started to evolve and adopt different features. For example, the garden pagoda from the Asian culture and different kinds of plants from around the world were introduced to Italy this transition occurred during the 1800s.72

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Unfortunately, during the early years of the 19th century, Italy witnessed a decline in the creation of new Italianesque gardens due to the social and political transition that Italy was going through. The communist idea made it taboo to show the fruits of one’s wealth, such as the ownership of an Italianesque garden, where only the highest and more privileged parts of society were able to afford it. This resulted in the adoption of the Italianesque style garden by other countries. At the end of the 19th century and beginning of the 20th century, England was the main country to adopt the Italianesque garden design. Charles A. Platt, in the late 19th century, published a book in the USA about Italian gardens and their architecture and history, as well as providing examples that he encountered on his long journey throughout Italy. Thus, Platt managed to bring to the USA the Italianesque style, which was adopted in many gardens around the country.

A fine example is the High Court Italianesque Garden in Cordish, New Hampshire, where Platt’s design used the local landscape to imitate the garden at Villa Falconieri, Rome. After that, Platt continued to work on transforming Cordish’s hill into the “Frascati of America.”

In the Platt’s plan of the High Court (see Fig. 72), Platt’s design concentrates on the axis that travels from north to south. At the south, there is the access road towards the Villa, and at north, the Villa has a 360 degrees panorama. On the west side, there are other sections of the garden more enclosed, but horizontal lines are focused on the Villa. In this landscape composition, the symmetry is still present, but not as overtly expressed as in the Renaissance style.

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Platt’s design plan shown in Figure 73 was for the Charles Sprague Estate in Massachusetts and was built in 1898. It has a more compact design than Cargill’s Castle but is situated in a similar landscape. The Villa is in the centre with paths around it, and, in every direction, the guests are lead back to the Villa. The axis is still present in the landscaping, as a means of arrival and departure, and the proximities are used to admire the landscape. The separation of the garden is easy to see, and symmetry plays an important role in the composition. As per the Renaissance design, the Villa is at the top of the hill, as shown by the steps that present on the vertical axis. The composition is very clever and does not divert attention away from the Villa, which is an important aspect to be considered when designing the landscaping for Cargill’s Castle.

The analysis of the Italianesque gardens has helped to pin down the main features to apply to the garden design for Cargill’s Castle. One of the central aspects is the use of axes, vertical and horizontal, which also separate the garden into different sections; this helps with the legibility of the landscape. The Italianesque garden is built to decorate or ‘crown’ the main structure (see Fig. 73), a vital feature that completes the design of the garden.

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Concrete and Ferro-Concrete style:

Introduction

Cargill’s Castle is one of the first examples in New Zealand of a residential project that used in-situ concrete. Over the years, the structure of Cargill’s Castle has lost its strength, and the surfaces of the walls are beginning to crack and fall apart. This section analyses the history of the use of concrete to finalise what are the possible causes of the failure of the concrete structure of Cargill’s Castle. The conclusion to this research, combined with the following chapter about the structural method of repair, helps to decide which technology to adapt to the repairs of the structure.

History

There are many archaeological sites in which concrete has been found. The earliest are dated to approximately 5600 B.C. near the banks of the Danube in the old Yugoslavia. The ancient civilisation mixed clay, limestone and pottery to build floors for the houses. Then more than 5000 years later, during the Roman Empire, around 199 B.C. concrete mixture was discovered and largely used around the Empire. It was discovered in the ancient City of Pozzuoli, where the ‘Pozzolana’ volcanic stone was mixed in the concrete to create a harder and faster setting concrete, even capable of setting underwater. The Romans, after learning the properties of concrete, widely used it in their building and infrastructure; it was poured in between walls of stone and brick to create a hard and solid central core. The most well-known building of the Ancient Roman time is the Pantheon (see Fig. 74), where the Romans stretched the diameter of the dome up to 43metres, using different layers of lightweight concrete with pumice inside the aggregate to lighten the load of the dome.77

After the fall of the Roman Empire in 476 A.D., concrete and its knowledge disappeared during the Dark Ages. For 1,000 years, the skills of the mixture were passed from father to son, where the concrete mixture was only poured to form foundations for erecting castles, especially in Britain during the Norman Empire.78

It was not until the 18th century that concrete came back as a new material to be used in construction. In 1759, John Smeaton was instructed to rebuild Cornwall’s Eddystone Lighthouse (see Fig. 75), a timber structure destroyed by the strong gales in the region. He decided to build the lighthouse with stone and mortar to bind each block. In 1862, the Smeaton’s book was bought by the young bricklayer, Joseph Aspdin, who consequently patented the cement mixture, calling the patent “An improvement in the modes of producing an artificial stone.”79

The concrete mixture became widely popular as a construction material, and by 1862 England produced approximately 203,000 tons of concrete, which was exported to countries such as the USA, Australia, New Zealand, South Africa, South America and Russia. The scale of, and demand for concrete was increasing rapidly, such that the number of factories producing concrete mixture in Germany increased from three in 1854 to 420 in 1882, and, by 1895 there were 1,274.80

It was not until 1854, however, that the idea of reinforced concrete came about. This new technology was previously called ‘Ferro-Concrete’. William Boutland Wilkinson, took the patent for the use of flat iron rod embedded in concrete, becoming the first to introduce the principle. But the effect of this discovery was not acknowledged by the construction industry.\textsuperscript{81} Just 40 years later, this technique was used by a French Architect, Anatole de Baudot, who built the St. Jean de Montmartre in Paris (see Fig. 76) using thin walls, slender columns and vaults. This technology started to expand in use by the end of the 19\textsuperscript{th} century. Pioneering the use of ferro-concrete was led by François Henebique, who called upon experts in the construction industry to trust in the new technology; he was the first one to substitute the iron rod for steel rods.\textsuperscript{82}


\textsuperscript{82} Onderdonk, Francis S. The Ferro-Concrete Style: Reinforced Concrete in Modern Architecture: with Four Hundred Illustrations of European and American Ferro-Concrete Design. California: Hennessey Ingalls, 1998.

Figure.76: Section St. Jean de Montmartre in Paris
In New Zealand, the new technology of concrete was surprisingly widely used. New Zealand has a vast amount of buildings built during the 1870s in which concrete was used; unusually, the technology was mainly brought forward by private contractors rather than government bodies.

In 1870, John Logan Campbell, known as ‘The father of Auckland’, was exposed to concrete structures at an expo in the UK. He decided to bring back the technology to New Zealand; with it, he built numerous buildings in Auckland, such as the Logan Bank (which no longer stands today- see Fig. 77). There were many more buildings built in concrete in the late 19th century from private houses and farm warehouses, to train stations and churches.83

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Figure.77: Old foundation of the Logan bank in Anzac Av.
The use of concrete in New Zealand was pioneered by Francis William Petre, who advanced the idea of the use of concrete more than any other architect in this period. An article about Petre’s design in Otago was published on 5 February 1876:

One of the surest indications of the prosperity of a young country is the growth of a refined taste in architecture.

In conclusion, we must compliment Judge Chapman on his taste and enterprise in erecting such a dwelling and too much praise cannot be bestowed on the architect Mr. F.W. Petre for his skill and judgment in the designing of such a building. We understand Mr. Petre is now engaged in the erection of a new house for Mr. E.B. Cargill, which promises to become an ornament to the suburbs of Dunedin.84

Petre’s best design or the ‘masterpiece’ of his career was the Dominican Priory in Dunedin, where concrete was used to establish a Romanesque architecture; once again, his love for Italy and the Italianesque appears as it has done in many of his projects.85

Petre’s attempt to venture into the use of reinforced concrete led him to make mistakes, which were visible on the site visit to Cargill’s Castle (see Fig. 35). One mistake was the misuses of the reinforced steel or iron used in the mix; the amount of steel used was not enough, and the steel, which was not embedded sufficiently in the concrete to protect it from rusting, caused the failure in the reinforcement. The use of larger stones in the structure weakened the concrete; smaller stones are necessary for the concrete to aggregate the mixture to reach its best potential. These mistakes have caused severe damage to the structure and a proper methodology of strengthening the structure is studied and selected in the next chapter. (Methods for structure strengthening are detailed in Appendix 1).


Design Development

Introduction

Cargill’s Castle location is spectacular. The adaptive reuse of the building respects the surrounding landscape; the revitalisation of the building introduces a new programme, including hospitality and tourism, within a location that the community and visitors alike can enjoy.

To revitalise the site, new structures and sections need to be added to the Castle; this creates more opportunities for activities such as dining, overnight stays, private functions and sightseeing.

The additional buildings do not pretend to imitate the original Italianesque look of Cargill’s Castle; rather, they utilise a modern approach to celebrate the different periods and history of the site.

The development of the site considers a significant modification of the present state of the property, with the use of landscaping and adaptive reuse to integrate all the new applications which revitalise the Castle efficiently.

This project answers Dunedin’s need for more tourist attractions and accommodation, also giving to the community a heritage site that they can enjoy and display to travellers as an iconic piece of Dunedin.

The hiking track towards the west connects with an old tunnel dug through the sandstone, which leads to a beach located at the bottom of the cliff. In the past, it was used as a private location, but today it attracts hikers to the area.

The landscaping of the site plays a vital role in the revitalisation of the area and has to integrate the spectacular view as part of the re-development by considering how the new structure impacts the cliff line from the sea.

The project highlights the historical significance of the building by reconnecting its heritage with the community of Dunedin.
Programme

The programme aims to give to Cargill’s Castle a different mix of uses, which allows locals and tourists to interact in the same location (see Fig. 78). The Castle is restored to become an attraction on the outskirts of the southern part of the city. Giving to the Castle a diverse range of uses enables it to reach a broader range of people, whether they are hikers, local families, professionals wanting private functions, tourists or locals that simply want to enjoy the panoramic view of the coast.

To achieve a mix of uses, the restoration of the site needs to achieve:
- Easier accessibility: by car, bike or foot.
- Structural strengthening of the original structure.
- An increase in accommodation for the Dunedin area.
- A connection between the Castle and the Dunedin community by showcasing the local history and culture.
- A spot for the local community to visit and give the reason to return.

The programme takes into account the local history of Dunedin, and how this restoration aims to create a hot spot of activities where the community and visitor can interact and enjoy New Zealand’s natural beauty.

Currently, Cargill’s Castle does not have any function or purpose; the creation of a tourist attraction and community-based spot in the southern part of the city can be beneficial for Dunedin and its residents.

The decision to provide the Castle with a mixed-use of activities allows the site to be used to its full potential, giving life to a space that would otherwise be unused.

The programme aims to develop diverse uses, rather than to restrict the area to one primary purpose. These are:
- New landscaping and garden for outdoor activities, such as Markets
- Exhibition area
- Greenhouse cafe
- Restaurant
- Function Space to be hired for a private function
- Accommodation Space

Figure 78: Programme diagram, interaction between spaces and people.
Interventions

Analysis of the existing building

The restoration process requires an understanding of the dimensions of the building and its surroundings. The site measurements enable a 3D model of the building to be the created and the possibility of creating different iterations during the design process.

In Figure 79, the dark grey part shows the original remaining structure built in 1867; the light grey part is the additional part built in the 1920s.

By analysing the original set up of the Castle, it is clear that the old layout of the Castle does not allow for much interaction between each side of the Castle. The side towards the cliff is completely closed off, and the only way to the cliff is to walk around the structure.

The horizontal axis (see Fig. 80) shows that, before the floor collapsed, the owners were able to move and access the site easily from east to west. To increase the freedom of movement for people around the building, there needs to be multiple entry and exit choices.

The red arrow in Figure 74 shows where the possible iteration is going to be and where the Castle needs to expand, allowing the site to include multiple uses as the new programme requires. In order to allow the free flow of people in the building, it is necessary to open new entryways in the original wall and to demolish part of the old structure that would otherwise interrupt the flow of people.

Figure 79: Accessibility existing Cargill’s Castle.

Figure 80: Accessibility existing Cargill’s Castle.
Design choices related to the site

At present, the site has two residential houses. During the restoration and development of the site, they are to be removed because they are on heritage building ground. The re-purchased site is joined with the existing Cargill’s Castle boundary, creating a larger site for the construction process (see Fig. 81).
The cliff on the south side of the Castle is very steep, while on the north side it is a gentle slope. The south side could be utilised to create an extrusion structure that gives the impression of reaching out towards the cliff. As illustrated in Figure 76, Cargill’s Castle is exactly on the top of the cliff, so the maximisation of the view is a crucial feature of the design of restoration of Cargill’s Castle.
Design Intervention I

The first intervention was the direct response to the studies of the structure’s needs (see Fig. 83). The first idea of the sectioning of the garden started, with a smooth flow to understand the segmentation. Cargill’s Castle is reinforced with steel columns and beams to allow for the new structure to be built inside.

On the east side, the additional building is located where once there was the Castle’s ballroom. The idea to dig under the structure allowed an extrusion out towards the cliff, to minimise placing an additional structure in front of the Castle and minimise altering the cliff’s profile. On the west side, there are possibly new additional buildings that could be used for the accommodation area.

This first intervention did not work for different reasons. The garden needs to offer more path choices and more ways to service the building. The number of paths has to increase, and there is no space for the farmers market, which is needed to attract locals.

The new additional structure to the east side overpowers the original Castle structure with a tall, heavy roof. The walls have no connection between the inside and outside of the building. More transparency is needed.

The west side of the Castle is underdeveloped. It is not the original structure, but still the old damaged structure from 1920 so that section needs to be redeveloped.

The large section dedicated to future accommodation is overtaking the site and possibly takes the attention away from the Castle.
Design Intervention 2

This intervention has advanced the design idea and programme for the site (see Fig. 84). The project experimented with how to attach new buildings to Cargill’s Castle and how to ease the introduction of new materials by imitating the geometry of the Castle.

On the east side in Intervention 1 was unconnected to the outside, now it is more open with large windows and entrances, to allow more light inside the structure, thus imitating the geometry of the windows and lines of Cargill’s Castle.

At this point, Cargill’s Castle has a new additional building attached on both sides, with a new glass atrium that extrudes past the point of the Castle towards the cliff to allow for a better view from above.

On the west side, the 1920 damaged structure is replaced by a flatter concrete paving. This function has not been decided yet because the site needs to have enough space to realise the multi-use programme.

The accommodation structures have been removed, giving more space to the market section.

The restaurant area below the Castle has been kept, creating a connection to the Castle through the new glass atrium.

In conclusion, this second iteration still has design mistakes that need fixing. The new east side is imitating Cargill’s Castle structure too much, and what is new and what is old is now hard to distinguish; this does not do justice to the original structure.

Cargill’s Castle’s original lines are not visible anymore, as the new addition is too big and hides the Castle.

The 1920 section on the west side needs further analysis in terms of structural integration. The new glass atrium is too big and too far forward as it hides the west side of the Castle; it needs to be resized and adjusted.
Design Intervention

The next section shows how the design iterations have brought to new solutions to the problems presented in the previous sections.

Cargill’s Castle’s developed design is presented and explained, showing how aspects of the programme for the site relates to each other and interact to make the new restoration work.

With the use of precedents, the intended design solution is better expressed to help to convey to the reader the idea of space and materiality that are experienced in the exterior and interior spaces of Cargill’s Castle.
Original Structure New use

Interior

Cargill’s Castle’s original structure has been left as raw as possible: the surfaces of the walls are not re-plastered; and the rough past and scars of the structure are left untouched as evidence of the history and heritage of the Castle.

The entire structure of the Castle has been reinforced structurally and seismically, with the use of a steel structure built-in and placed alongside the walls. The structure has been analysed and studied by a team of engineers to discover weak points in the original concrete pour, in which grout can be inserted later to reinforce the structure permanently.

Where once there was a timber staircase, now there is a more modern one, with lighter materials; it is made of glass and steel to allow one to experience the full height of the entryway.

Reconstruction of the first and middle floors of the Castle is essential as the original timber structure was lost. The division of the room remains as the original architect intended, allowing the visitor to understand how, in the past, people experienced the house and lived it. The Castle’s original structure is now an exhibition area, showcasing historical pictures and artefacts of colonial Dunedin (see Fig. 85).

The lower part of the tower includes the exhibition areas, but, at the top, the tower extrudes out, into a modern structure made of glass and steel; thus, visitors can access it from the lower floor of the tower and experience a 360-degree view of the surroundings. This modern addition to the tower acts as a lighthouse during the night, making the Cargill’s Castle visible also from the sea.
Figure.85: Indicative view of exhibition space
Function Area

The function room is the additional modern structure added to Cargill’s Castle; located on the westside of the site. This section is the modern addition to the whole structure. The materials of the wall are modern, precast concrete to highlight the two different eras of the evolution of concrete. The contrast of the new smooth surface and the old walls is visible from the outside.

The new modern function wing imitates the square Castle design, with the hidden roof behind the higher parapet, but with a more modern finish and approach to the material.

In the inside, the ceiling is designed to acoustically insulate the room in order to avoid reverberation of sounds because the function room can host up to 100 people. The insulation mechanism is designed as a ceiling feature in the room given that the walls of the function area are mostly glazed (see Fig. 86).

Figure 86: Indicative view of function area
Atrium Feature Stairs and Elevator

Entering Cargill’s Castle and walking toward the west wing of the structure through to what was once the kitchen, the glass atrium addition can be found.

The atrium plays an essential role in the movement of the patrons inside Cargill’s Castle, bringing the visitors to the upper and lower levels.
Cargill’s Castle’s location offers a unique panorama that can be enhanced using a glass and steel staircase and elevator to avoid obstructing the scenery and to increase the lookout opportunity in every corner of the building.

As can be seen in Figure 87, the glass elevator and the glass staircase have a slim steel component; its modernity contrasts with the harsh surface of the original wall of Cargill’s Castle.
The staircase wraps around the elevator, which then later carries on to the middle and top floors of the Castle. This allows the staircase to bring visitors on the south side of the atrium; they can slowly walk toward it and the panorama of the cliff and the ocean is revealed. The glass elevator and staircase also allow natural light into the darker part of the restaurant.
Greenhouse Cafe

In the design for Cargill’s Castle, the café area offers a mixed use between the greenhouse and the café (see Fig. 88 and Fig. 89). This area allows the public to interact with the structure while resting during the hike toward the beach tunnel. The café allows the public to enjoy the view from the cliff in an enclosed area, during the winter and summer days; the greenhouse has a natural ventilation system to control the temperature, and the temperature is kept constant for the exotic plants inside.

It is vital to keep the space as interactive as possible for the public in order to make them feel comfortable in the space. The tables and chairs are closer to the plants and flowers; the flow of the greenhouse has two hallways along which the customers can walk to admire the exotic plants or sit at the sides of the path to admire the view. The ceiling and walls are composed of glass to maximise the amount of sunlight that penetrates the greenhouse and benefits the plants. The café area for the preparation of the coffee and counter food is located on the western side of the greenhouse. The staff area has an internal elevator connected to the restaurant’s kitchen below, which is for the preparation of the main dishes and snacks.
Figure 89: Indicative view greenhouse cafe at Cargill’s Castle
Restaurant Area

The dining level at Cargill’s Castle is below the original structure; the existing foundation has to be reinforced and deepened to allow enough height for the restaurant area (see Fig. 90). The earthwork takes advantage of the steep hill to create a spectacular view of the ocean.

The restaurant area is accessible only from the atrium, in which there are the stairs and the elevator that service every floor of the structure. The stairs and elevator are on the north side of the Castle. The clients can walk towards the south side and reach the cocktail bar, placed in the middle of the floor; here, clients can be directed to their reserved tables or seated along the bar. The restaurant area hosts up to 120 people during the winter and double that amount during the summer months.

The 85 m² kitchen is at the back, with a staff elevator to service the café area directly above it. This section of the floor is soundproof and large enough to service the restaurant, café, and function area. Toilets are placed at the back of the floor, easily visible when walking down the stairs.

The clients of the restaurant can enjoy a 35-metre glassed belvedere from which to view the ocean; during the summer, the restaurant doors can be opened, allowing the restaurant to bring the service outdoors (see Fig. 91). The outdoor area has glass screens because the southern wind can have gusts that can ruin the restaurant’s service. The outdoor area has a set of stairs that allow the clients to walk down the hill toward the steeper part of the hill. Retaining walls are built on either side of the outdoor area to section out the ground and plants from the paving area.
Figure 90: Plan restaurant at Cargill’s Castle
Figure 91: Indicative view Cargill’s Castle restaurant
Tower

The tower is one of the main features of the project (see Fig. 92). The structure of the tower is reinforced; the floors are reinstated at the same height as the original ones. The tower is accessible from the second level only, not from the ground floor, saving space for the exhibition area in the Castle.

At the top of the tower, visitors can have a 360-degree panorama of the whole site, as the modern extrusion is made of glass and steel. In addition, the top of the tower will act as a lighthouse, with a light that will illuminate the location of Cargill’s Castle from afar.

Figure.92: Indicative view Cargill’s Castle tower
Accommodation

The new programme includes accommodation by offering tourists and visitors the opportunity to book one of the rooms at Cargill’s Castle’s boutique hotel. The new accommodation wing is on the west side of the property and is reachable from a path through the existing pine trees.

Cargill’s Castle’s boutique hotel can host a maximum of 30 guests, with an allowance for two guests per room. The boutique hotel has a reception area that leads the guests to the breakfast area and guest lounge. The rooms are on the ground and first floors of the complex, accessible from the stairs and elevator in proximity to the reception. All the rooms are facing south, towards the cliff in order to give the guests the spectacular view of the ocean.

As described in the Scope and Limitations section, this project will not focus on the separate wings of the restoration project, but only on Cargill’s Castle’s new sections.
Front Garden

The front garden is the introducing element of the project. At present, the front garden needs remodelling and landscaping work so as to later introduce the important elements of the Italianesque garden, such as the pathways, edges, square and the vertical and horizontal axes to integrate the Italianesque garden with Cargill’s Castle and the new additions. With the old garden gone, the Italianesque garden takes its place; this is the style that Francis W. Petre wanted to express for Cargill’s Castle so as to highlight the strong relationship that the original architect had with Italy.

At present, the Castle does not have an existing path; the Castle can only be reached by walking through the bush.
As can be seen in Figure 93, three existing structures on the site need to be demolished

Figure 93: Existing site plan Cargill’s Castle
The pathway needs to be wide enough and durable enough for services such as delivery vans, cars and rubbish collection vehicles. The path is accessible only at certain hours of the day. The main pathway leads to the main entrance of the Castle, while a separate path leads to an enclosed location where the waste and rubbish can be collected; this allows services to run without disruption.

The garden covers the whole northside of Cargill’s Castle, where the structure provides some cover from the strong south winds.

The landscaping is structured on the vertical and horizontal axes, which run from north to south and from east to west. Axes are a classical feature that an Italianesque garden needs to have to allow for symmetry in the composition and sectioning of the garden. In the middle of the garden is a ‘Piazzale’, which enables weekend markets to create community-based entertainment for locals and tourists to the site.

On the east side, the new hiker track leads the visitors to the front of the Castle, where they are able to decide if they want to carry on with their hike or if they want to stop for a rest by visiting the greenhouse cafe or enjoying the garden’s free space for picnics and other activities.

Figure 94: Proposed site Cargill’s Castle
A small part of the modern Italianesque garden is enclosed; it is located in the greenhouse café to showcase exotic plants and flowers. A larger variety of plants are outdoors, the ones that are seasonal or can resist the cold winter. The larger trees on the east and west sides of the property remain, allowing some protection from the ocean winds; only selected trees are removed to allow for the construction of the additional buildings and new path that leads to the boutique hotel. As the new project takes over the whole site, the residential house which at present sits on the east section needs to be demolished.

In front of the Castle, there is a belvedere, a panoramic lookout which can be accessed from the square in the main garden by walking south through the Castle. The lookout to the ocean is also part of the track which welcomes the hikers into Cargill’s Castle. The cliffside in front of the lookout has been dug out, creating a flat area that the restaurant uses to offer customers an outdoor service during the warmer summer months.

On the west side of the Castle beyond the existing pine forest, the new pathway extends to a new flattened area. This is where the new boutique hotel is located, allowing visitors and clients to stay overnight.
Figure 95: Cargill’s Castle south view
Cargill’s Castle New Hiking Track

This section analyses part of the specific audience that the new programme for Cargill’s Castle wants to attract. It is essential to investigate if there are enough people that can make the restoration work. How does the new programme attract visitors and bring them to Cargill’s Castle? The restoration does aim to bring not only the Dunedin community to Cargill’s Castle, but also a broader spectrum of people, including visitors from other parts of New Zealand and from overseas.

This section can be supported by marketing research in order to attract visitors and consider the best way to achieve a constant flow of visitors.
Hiking in New Zealand has attracted over 1.1 million people over the last three years (see Fig. 96). People are coming to New Zealand because the country offers unique panoramas and birdlife. The majority of the visitors that come to New Zealand are from a range of countries: Australia with 29%, China with 15%, America with 11%, Britain with 7%, Germany with 6% and Japan with 3%; the average spending per person has increased in the past years, from NZ$3,900 to NZ$4,100.86

Tourist tracks are divided into two different types: long tracks and short tracks. Long tracks include the 10 great walks of New Zealand, which limit the number of people that can participate at the same time because many of them have bush huts that need to be booked in advance, and many of them are already booked out for the next two years. Of the number of tourists that use the tracks, 69% of them use short tracks, which are approximately three to four hours’ long. These short tracks are easier to do because they do not need to be booked and are easier for the middle aged group, which makes up most of the tourists that come to New Zealand.87

The revitalisation project of Cargill’s Castle must consider a broader spectrum of attractions. This is achieved by joining together two existing tracks and creating a path that includes Cargill’s Castle as a resting area and the existing beach tunnel as the finishing point. This new track is 8 to 9-hour walk; it starts from the south-east side of Dunedin and finishes on the south-west side of Dunedin, where the beach tunnel is located (see Fig. 97).

This track also allows the tourists to choose where to start and finish, meaning that they can choose to drive to Cargill’s Castle and only do the two hour walk, from the Castle to the beach tunnel and back. The integration of Cargill’s Castle with the track increases the public activities on the site. Furthermore, the site accommodates tourists in the new boutique hotel, which could be booked by the tourists or people who book the function area at Cargill’s Castle.


Figure 97: New hiking track for Cargill’s Castle
Conclusion

Heritage buildings are being disregarded and forgotten, unable to answer to the needs and wants of today’s society. Cargill’s Castle has long lost its ability to host a programme and have a function; it is, thus, on the edge of becoming forgotten. Today, modern technologies make it possible for heritage buildings to be welcomed into modern society without losing their cultural and historical features.

Around the world, architects, engineers and professionals in the construction sector have been involved in many restoration projects. The most appropriate were used as precedents to help with the outcome of this restoration project. Some of them were successful and some others were criticised by the public. Studying the literature on conservation and good case studies have helped to find the most viable solution for Cargill’s Castle. The tests and trials made to reach the final design have been many. However, there are always multiple paths that a restoration project can follow.

One of the biggest fears is that the restored building falls into misuse, resulting in an inconclusive design job, waste of resources and the building to fall into decay again. This project tried to counteract this possibility by giving Cargill’s Castle multiple functions. Nevertheless, there is the potential for friction between the idea of many main functions for a site and the fact of a small structure (1,500m²).

Adaptive architecture gives historical or old buildings the purpose they need to be actively used by the community. International regulations regarding the protection and method of restoration need to be followed. Therefore, Cargill’s Castle has kept its original form, and the new contemporary section has been added separately from the original fabric of the Castle. The addition of a building with new material is not a bold and aggressive design on the old fabric, as light design elements introduce it.

Following the shape intended by the original architect, the Castle’s geometry has been extruded and repeated, using modern, smooth and reflective materials to contrast with the original surfaces. The original fabric of the building had to be secured and reinforced; new structural technologies reinforce the structure with minimal alteration, allowing the old to rest on the new.

Over time, populations have built thousands of different types of structures and buildings, where the environment, culture and historical time have contributed to making each one of them unique, with different needs and personalised designs that make it possible for them to fit into to our modern-day, restoring more of them would enable them to be passed on to future generations.

“Repair is the creative destruction of brokenness”

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Hocken Snapshop https://hocken.recollect.co.nz;
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Appendix 1
Earthquake Strengthening and Securing the Structure

Multiple forms of structure strengthening have been applied successfully to the damaged structure. These different methods are going to be studied and at the end of the chapter selected and applied in the strengthening of Cargill’s Castle as its damaged structure requires foundation and walls strengthening to make the structure safe for the future inhabitants. The reinforcement strategy considers irreversible and reversible method of reinforcement and strategically understand which of them is best to apply the damaged concrete structure.
There are many different types of earthquakes strengthening interventions that are currently being used on a heritage structure. These interventions can be permanent or non-permanent and are placed in situations of intense softening and deterioration of the structure. Grout injection, is a method developed to fill the void or cracks in the soil, which create instability in the structure and foundations; there are many different kinds of grouting system:

Permeation Grouting:

This type of grouting system is the most common, as it is used in the soil to fill cracks and voids in rocks, in the existing concrete or other permeable materials. This type of grouting is used to give back strength to existing foundations and walls, as it does create a waterproof solution to the voids, the grout is injected by circulation or a direct grout system.\(^90\)

![Permeation grouting](image)

Compaction Grouting:

Also known as Low mobility grouting, this system injects grouts in small cracks. The fill is composed of compressed cement, water, ash and sand. This system is used in smaller cracks and applied by drilling casing and by pressure inject, by filling the crack from the bottom-up.\(^91\)

![Compaction grouting](image)

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Fracture Grouting:

This type of grouting is typically used to re-level structures, the type of filler used is a low viscosity grout that penetrates the ground, it hydraulically creates and fills fractures to reach existing ones, also used for the displacement of existing soil under the structure.92

Jet Grouting:

This type of grouting is high pressure by the use of water, air and sand it corrodes the soil and at the same time fills the cracks with high-viscosity grout, which combined with the soil creating “soilcrete” used for cemented round columns and efficient in any type of soil.93

Vacuum Grouting Consolidation:

The system requires an under-pressure system. Once the cracked is sealed and under pressure, the ground then is sucked into the crack. This system usually used in a situation where the cracks are easily reached and sealed, such as walls and compact the soil by using a series of concrete channels in the ground.94

Flowable mortar infill:

This method is used in cases of cracks around 20 to 100mm wide; this system is preferable then grout as the sand and mortar fill flows better in the cracks. In these cases, steel rods can be inserted in the cracks to join and strengthen the existing concrete block. The mixture for these types of infill needs to have the ability to flow down the crack, to allow for that, the composition of the fill consists of hydrated lime powder, limestone powder, pozzolan ground and a viscosity modifier.\(^{95}\)

Deep repointing mortar:

The restoration project often adopts this technique. This system requires the retrofitting of the mortar in between the bricks joins, the restoration of the wall requires the analysis of the existing mortar, to be able to match the new fill with the old one, and also to add extra strength by adding strengthening agents.\(^{96}\)


Reversible Interventions:

Punching Steel Bars:

Considered not invasive and efficient in prolonging the life expectancy of the structure. Industrially manufactured steel rods are very efficient; issues normally occur in the installation and the technique of the installer. Before the installation of the rods, the structure has to be analysed and tested for weak structural points and earthquakes strengthening; this process pinpoints the exact location and stresses that the rods need to sustain. This type of intervention is used all over the world has it is an efficient method to secure a structure safely.  


Bonded to surface:

This reinforcement technique began in construction around the 1900s. It required mesh made of steel rods or different matrix systems which can also be material such as carbon fiber, glass fiber, aramid fiber, alkali-resistant glass, basalt or bio components such as hemp or flax. They are bonded on the surface, giving strength and protection to the structure. In this system, the main stresses the matrix can develop a detachment to the surface over time. The bonds of the anchorage of needs to be measured accurately to avoid the matrix detachment from the structure. 

In conclusion, considering Cargill’s castle’s specific structural deterioration, more than one structural strengthening approach needs to be used. The first selected method is the jet grouting, as it deepens the foundation of Cargill’s castle, and thickens them, making them able to support load and stresses.

For Cargill’s walls, there is the need to use an irreversible and reversible method of strengthening, due to the severe damage. The irreversible method is the flowable mortar fill, as it consists in driving steel rods in the wall, insert steel rods and fill the crack with a more liquid mortar, allowing to fill the smaller cracks in the wall and the one up to 100mm wide, as Cargill’s concrete wall is made of large rocks which create interior and exterior cracks in the wall that the liquid mortar can fill. The reversible is bonded to the surface, this method with steel beam and columns retains the solidity of the structure, and protect the Cargill’s castle in case of an earthquake.
Appendix 2 - Historical Photos

Figure 107: Drawing Cargill’s Castle
Figure 108: Photograph from plane of Cargill’s Castle
Figure 109: Photograph from plane 2 of Cargill’s Castle
Figure 110: Photograph from plane 3 of Cargill’s Castle
Figure.111: Photograph Cargill’s Castle 1892
Figure.112: Photograph Cargill’s Castle 1892 after the fire
Figure 113: Photograph Cargill’s Castle 1930 with the glass house
Figure 114: Photograph Cargill’s Castle 1983 in state of abandon.
Figure 115: Photograph of documentation about Cargill’s Castle

CAPTAIN WILLIAM CARGILL’S RESIDENCE AT HILLSIDE

After a brief residence at Clifton Cottage, Princess Street (section 45 block VII), Cargill settled at Hillside, Covrham, on his ten-acre suburban section (section 12 block VII town district). On 31.10.1868 the section was transferred from William Cargill to William Walter Cargill. [The deed is unpublished.]

The photograph of Cargill’s house and section at Hillside taken by William Malcolm, probably in 1899, shows the home well entitled. The house appears to have been the same as shown on the plan, shown here, of 1870 with the lofts above the roof and the entrance gate on the side of the main south road. Fence lines are distinctly shown on the photograph; the upper one in the southeast terminus of Cargill’s section and separation from section 12 on which the St Andrew manse and Tennison’s school were erected, shown green on the plan.

Captain Cargill died in August 1900 and Mrs Cargill continued to live there, according to directories, till her death in 1907. The section was transferred from William Walter Cargill to John Cargill and Edward Kemp Cargill on 31.12.1908, and E. B. Cargill was resident there for a time before he moved to Meiville Street and finally settled at The Cliffs, 83 Clair.

Malcolm’s photograph of 1899 shows the Hills South Road at top right, and the bend where the Eglington road branches, and the bend between the road and the farm which was then property of William Brigden (who established a tannery at Covrham in 1863). In 1894 the Rev. Donald MacNeil acquired this land for a manse for St Andrew. A Memorial of 1893 transferred this section 10 to the Missionary Church at Covrham. Malcolm’s was at the house at Hillside from 1903 to 1907. In 1857 the Rev. Robert Forsglen was minister at St Andrew and lived at the house, Cargill’s Hill. He was succeeded in 1890, reinstalled, and succeeded again in 1875. In the directory for 1859 his name appears next south to that of Mrs Cargill, which is consistent with the entrance to Cargill’s house being along the contour of the hill as shown on the Malcolm photograph, and the entrance to the house where it is today.

In 1907 the Rev. Herbert Saddell was minister at St Andrew and his private residence at that date was the house, Cargill’s Hill.

The school which, with the manse, still remains on section 15 was a private one, run by the Rev. Thomas Tennison. The directory for 1898 gives him as resident at Cargill’s Hill where the schoolhouse now is. At the turn of the century St. Swithin, Elizabeth Tennison was living at the schoolhouse and manse and their son, Reginald Tennison, was running an opal factory there. In her will, Mrs Tennison, who died on 13.3.1908, left the property of the manse and schoolhouse (section 15 block VII part 177) to her son; Augustus Herbert Tennison and Reginald Swithin Tennison.

Between 1875 and 1880 E. B. Cargill’s section 12 was subdivided. Some land was transferred back to the Creek, given on the plan, to provide access to the building plots. The subdivision left Cargill’s house on plot 7, yellow on the plan, with access from the Hills South Road approximately as before but along a proposed road, shows solid pink.

The Cargill house became the residence of William Day’s to the end of the century, and of his widow until it was burnt down about 1901.

Greaves’ School was then extended, as outlined in blue, over the site of the Cargill house to the boundary, and a partial re-allocation gave existing sites access to the extended Greaver Street instead of to the proposed road.

In 1903 a new plan was agreed to by the Covrham Borough Council, Robert Glendining, and Mrs Elizabeth Tennison. The key plot was occupied by Mr Turnbull and his wife, as on the area reserved in 1876 for a road, which means it is also on the original access track to the Cargill house.

This is interesting because the Malcolm photograph shows three trees by the stream from the Cargill house to the road where the gate is) and where the Turnbull house is now, and Mr Turnbull has shown there are the stumps of these trees under his house, just where, preceding to the plan and the photograph, they should be.

The photograph of the Cargill house taken in the late 1890s shows the slope of the ground to the east and a circular look. This led would now be under the house next below the Turnbull’s, and it is opposite this house that the Cargill house would have been situated, mostly on what is now the top of Greaver Street.
Appendix 3 - Dunedin in 1800

Figure 116: Photograph of demolished Oriental hotel 1863
Figure 117: Photograph of demolished Gillies & Street building 1860
Appendix 4 - Final Presentation

Castle on Edge

Adaptive Re-use of Cargill’s Castle and its site, Paul Logan 14/12/10 Principal Supervisor: Graham McConnell, Associate Supervisor: Rona Jackson-Hiley

Figure.118: Final presentation
Thank you