THE FLOYD'S ROOF PROJECT

Dr R.J. (Buzz) Sanderson, BE PhD MIEAust CPEng NER
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Kandos Methodist Church, circa 1920

SYNOPSIS

The main building of the Kandos Museum was formally the nave of the Methodist Church. This building was commenced February 1919 and officially opened at 3:00pm, Saturday September 20th of the same year. The church was designed by Floyd S. Richards and was executed in the material that was to make Kandos famous, cement.

The roof of this building is of particular significance being an early Australian example of a cast in-situ flat reinforced concrete roof supported by integral beams. It is thought that the roof, and the church itself, were a demonstration of the new construction techniques made possible by concrete. These techniques would go on to dominate construction of multistory buildings to the present.

Approximately 30 years ago, remediation of the roof was undertaken by the then owner, Rylstone Shire Council, and a hip roof was constructed over the existing roof with metal closure. This fundamentally changed the architectural intent of the building and obscured the technical innovation that it contained.

The “Floyd’s Roof Project” is to restore the original roof line to the building by removing the over-roof, make good the original concrete roof and to water seal it.

By undertaking this project the museum will be better able to tell the story of Kandos and its significant contribution to nation building in the 20th Century. This will strengthen the museum’s role in the arts and culture sector and the visitor economy.

The benefits to the wider community through volunteer engagement in the project, preservation of an important and valued building, increased pride of place and increased participation in the visitor economy.

The estimated cost of this project is $55,000 in total with a contribution of approximately $15,000 of volunteer labour and in-kind services.

FLOYD’S ROOF

The “Floyd’s Roof Project” is to restore the roof profile of the main building of the Kandos Museum, the nave, to the original form by removing the timber and sheet metal over-roof which was part of remedial works undertaken in the late 1980’s.

A BRIEF HISTORY

Kandos Museum is housed in what was originally the Methodist Church in Kandos.

At the Auction Sale conducted on August 14th 1915 by the cement company, the Reverend Morris-Yates purchased the two allotments at 22 & 24 Buchanan St to establish the Methodist Church. These two allotments are near the high point of the town and have a commanding position at the head of Jaques Street.

Two in particular are responsible for the construction of the church, James Dawson and Floyd S. Richards.

Dawson was the local surveyor and responsible for platting both the cement plant and the township and it is the Dawson name that is inscribed on the foundation stone of the church. The Dawson residence was a property of some size named Henbury which is now the Kandos Golf course marking the north-western extent of the township. Latterly the gates to Henbury were transported to the church site and incorporated in to the front garden wall as a memorial to Jessie and James Dawson.

The other, Floyd S. Richards came to Kandos from Sacramento, as the commissioning engineer and general manager of the plant for the NSW Cement, Lime and Coal Co Ltd, later to become Kandos Cement Ltd. The Richards family took up residence in the manager's residence at the peak of Campbell and MacDonald streets, the only location within Kandos with commanding views of both the township and the cement works.

Floyd designed the church inspired by the Spanish Mission architecture of his native California and his hometown church. Or so the apocryphal story goes.

Where does fiction overtake fact? Floyd Richards was born in Wolverine Michigan and educated in that state. At the time of his marriage, 1907, he was 24 years old and working as a chemist at Alpena Portland Cement Co. which commenced operation in that same year at Alpena MI. In 1910 Floyd was the superintendent at the cement plant at Toronto Township (now Mississauga) Ontario, Canada and developing a reputation for being able to get the job done. To date there is no evidence to support Floyd being a Methodist.

The church is a simple design the primary structure formed by eight poles laid out in two rows to form 3 bays, topped by horizontal perimeter beams and two cross beams supporting an integrated cast in-situ flat concrete roof. The secondary structure of the building consists of the infill between the poles, the parapet atop the roof, the bell tower and the internal tiered floor that near follows the original grade of the land. The building was executed using the product that Kandos was to become famous for, cement, Figure 1.

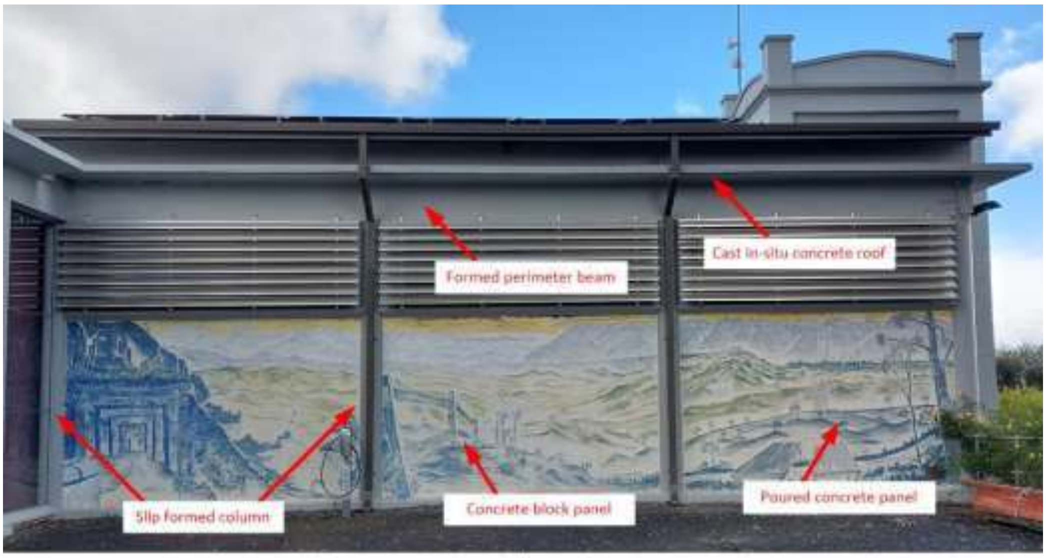

Figure 1: A view of the east wall of the Kandos Museum showing the primary structural elements of the nave. Photo credit Kandos Museum 2022.

Plans for the church were approved by Rylstone Shire Council in mid-January 1919 and the Foundation Stone was laid almost within the week on the 25th at 3pm[1]. At 3pm on September 20th, the Church was declared officially open, Figure 2.

[1] B. A. Fleming, *History of Kandos*. 1984 ISBN 0 9591328 0 5

Figure 2: Kandos Methodist Church. The foundation stone was reported as being laid at 3pm Saturday January 25th 1919 and the church officially opened Saturday September 20th at 3pm*. Kandos Museum archive circa 1922*.

Clearly both men occupied influential and powerful positions within the emerging township.

Figure 3: Floyd S. Richards, commissioning engineer and first manager of the Kandos Cement Works. Resident in Kandos 1917 to 1923. *Kandos Museum archive*.

The inter-war period saw additions to the church with a skillion roof tank stand added to the nave which over the years evolved in to a Sunday School and meeting hall with fireplace. To the east of the nave was flattened and a tennis court formed.

The amalgamation of the Methodist and Presbyterian churches to form the Uniting Church in the 1970's precipitated to the sale of the church to private interests in 1982 with the intended conversion into residential flats. The conversion did not eventuate.

With the coming of the Bicentenary celebrations in 1988, public funds became available and the church was acquired by the then Rylstone Shire Council and the museum established, Figure 4.

Figure 4: Kandos Museum 2013. View showing the main entrance to the nave. *Photo credit Kandos Museum*.

During the early 1990's remedial works were undertaken by the Rylstone Shire Council[2] to make good some concrete cancer in the roof structure. Anecdotally at the time, consideration was given to either "fibre glassing" the roof or to pitching an over-roof using timber trusses and corrugated metal sheeting. The latter option was pursued and a "ripple iron" ceiling was installed under the roof slab to complete the process.

In 2013, Mid-Western Regional Council, the successor to Rylstone Shire Council, decided to divest themselves of the property and the museum citing difficulties in running of the facility. Council resolved that they would vest the museum and the real property in a yet-to-be-formed, not-for-profit association and called for expressions of interest. A transitionary period was entered into with the new association and MWRC collaborating to see the successful re-opening of the museum on October 14th 2014 by His Excellency General the Honourable David John Hurley, on the occasion of the Centenary of Kandos, Figure 5. In due course the title of the museum passed to the association in 2015 along with the goods and chattels.

Figure 5: His Excellency General the Honourable David John Hurley, Governor of NSW (at right) and Mrs Peg Butler (at left), a founding member of Kandos Museum at the official re-opening of the museum, 14 October 2014. *Photo credit Karon Grant 2014*.

[2] https://en.wikipedia.org/wiki/Rylstone_Shire

As part of the transitionary arrangements remedial works and improvements were undertaken collaboratively between MWRC and the Association. These works included the installation of a flat floor in the nave, a new floor in the inter-war addition making the floor level consistent throughout the building, improvements to lighting, drainage and plumbing, the installation of toilets and kitchen facilities along with painting of the interior. These works culminated in the issue of a Certificate of Occupancy for the building prior to transfer of title.

In 2017 a solar electrical system was added to the museum. This system is fixed to the over-roof of the nave. Additionally, in 2019 air conditioning was installed with some of this infrastructure impacting upon the over-roof and penetrating the original concrete roof, Figure 6.

Figure 6: View showing the underside of the over-roof and the original concrete roof of the Kandos Museum (nave of the former Methodist Church). ***Photo credit Kandos Museum 2022.***

Other works undertaken at the site since re-opening in 2014 include landscaping of the allotment at 20 Buchanan St, establishing an external display area for some of the museum's collection of machinery and building of an annex to the museum for storage and to provide visitor amenity.

SIGNIFICANCE

The roof of the nave is of particular significance being a very early Australian example of a cast in-situ flat reinforced concrete roof supported by integral beams. This is an example of a technique that would go on to dominate construction of multistory buildings to the present.

Floyd's Roof is significant for a number of reasons.

Floyd S. Richards came to Kandos as the commissioning engineer and general manager for the NSW Cement, Lime and Coal Co Ltd, later to become Kandos Cement Ltd, and importantly he came from the Mid-West United States, which at the time was vibrant in the use of cement and concrete.

These two things resonate to give Floyd's Roof both a national and an international context and an importance to both the township of Kandos and to the nation.

Reinforce concrete did not come into common use on a large scale until the 1890's when it was used by Ernest Leslie Ransome, born 1844 Ipswich England but resident in California (d 1917), and in France by Francois

Hennebique (1842-1921)[3]. Both men are responsible for important works and both men made pioneering contributions to the development of the reinforced concrete industry.

Ernest Ransome was the son of Frederick Ransome[4] who developed an artificial "sandstone" used in decorative works and in whose factories he served his apprenticeship. Ernest Ransome moved to America in the 1870's and is credited with devising the most sophisticated reinforced structures in America at the time. In 1884 he was awarded US Patent 305226 for a system of ferro-concrete with iron rods twisted to improve the bond and subsequently developed a patented system for practical reinforcement, the Ransome System.

In 1886 Ransome built two reinforced concrete under-bridges in the Golden Gate Park in San Francisco, the first reinforced concrete bridges in the USA and amongst the first handful of such structures in the world. The Alvord Lake Bridge[5] survives to today and is designated a Historic Civil Engineering Landmark by the American Society of Civil Engineers.

He also built buildings, among them:

- The Torpedo Assembly Building, eastern end of Yerba Buena Island, 1891,
- The Leland Stanford Junior Museum of Art, Stanford University Sacramento CA, 1894.
- The Pacific Coast Borax Refinery, Bayonne, NJ, 1897,
- Ingalls Building[6], Cincinnati, OH, 1903.

Both the Torpedo Assembly Building and the Leland Stanford Jr Museum survived the earthquake and fires of 1906 and stand today but it was the Borax Refinery, Bayonne NJ, which in 1902 survived a fire that was, reportedly hot enough to melt brass, which vindicated of Ransome's work.

> *"The Pacific Coast Borax fire was, it appears, the triumph and vindication of Ransome's professional life. That Company's building at Bayonne, erected in 1897, had been his first work on the East Coast and is also reputedly the first complete reinforced concrete factory to be erected on that side of the country. The fire and Ransome's great and growing reputation as an inventor and constructor combined to give a kind of charisma to reinforced concrete as the material of the new industrial age; and Ransome was only one of a number of forceful new engineering personalities who appeared upon the scene as exponents and exploiters of this seemingly miraculous material."*[7]

In the first decade of the twentieth century, progress in reinforced concrete was rapid. Extensive testing to determine beam behaviour, the compressive strength of concrete, its modulus of elasticity were conducted by Arthur N. Talbot at the University of Illinois, by Frederick E. Turneaure and Morton, O. Withey at the University of Wisconsin and other researchers, culminating with the publication of the first textbook on reinforced concrete design, *Principles of Reinforced Concrete Construction* by Turneaure and Maurer, 1907.

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[3] *Sigfried Giedion*. *Time, Space and Architecture*, Harvard University Press. 5th Ed. 1967 pp325

[4] https://en.wikipedia.org/wiki/Frederick_Ransome

[5] https://en.wikipedia.org/wiki/Alvord_Lake_Bridge

[6] Standing 15 floors tall it is the world's first reinforced concrete skyscraper and was reinforced using the Ransome System of reinforcement which was executed by engineer Henry N. Hooper. Still in use today as a Courtyard by Marriott Hotel, the building was designated a National Historic Civil Engineering Landmark in 1974 by the American Society of Civil Engineers. In 1975, it was added to the National Register of Historic Places. https://en.wikipedia.org/wiki/Ingalls_Building

[7] *Banham, Reyner (1989). A Concrete Atlantis: U.S. Industrial Building and European Modern Architecture 1900-1925. Massachusetts:* The MIT Press*. ISBN 0-262-02244-3*

In 1912 Ransome added to his legacy when, along with co-author Alexis Saurbrey, *Reinforced Concrete Buildings*[8] was published. This monograph was informed by the then known science, the emerging research of the day and by the experience of the practitioners; it laid the foundations for a generation of engineers and architects that followed, Figure 7.

Ernest Ransome's work appealed to the new, emerging, vigorous technocracy with its economy, clean lines and structural capacities. Albert Kahn's Packard Motor Plant[9] in Detroit, 1903-1905, saw one of the ten buildings executed in reinforced concrete. Propelled by the success of the Model T in 1908, Henry Ford commissioned Kahn to design the Highland Park[10] facility, to put production under the one roof. Using reinforced concrete and large steel-framed windows Highland Park was not only a better environment for assembly workers but demonstrated a new way for industry and a new way of doing business. Reinforced concrete was the very essence of modernity[11], it was Modern.

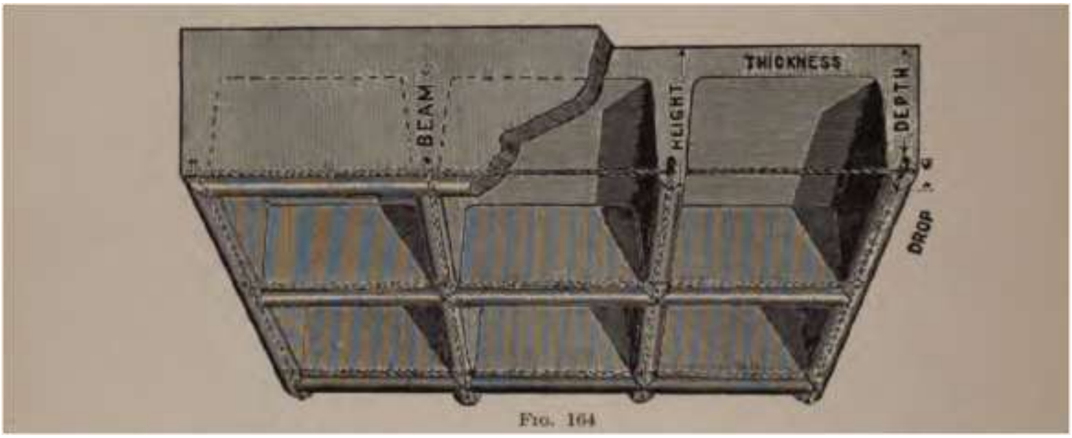

Figure 7: An illustration of integrated slab and beam from "Reinforced Concrete Buildings" by Ernest Ransome and Alexis Saurbrey. 1912. The idea of the integrated slab and beams is immediately apparent.

Did Floyd S. Richards know Ernest Ransome? Possibly, both were certainly intimately involved in the cement-concrete business. However the 1900 US Census records Ransome living at 532 9th Street in Brooklyn, NY and the Ransome family in Plainfield, NJ, by 1910. Certainly at a minimum Floyd Richards would have known of Ernest Ransome and his work and of the treatise, "Reinforced Concrete Buildings".

Floyd would also have been aware of other developments within the cement and concrete industries.

James MacDonald, of MacDonald Engineering of Chicago, pioneered silo construction using slip formed concrete. His concept of placing circular bins in clusters was patented, with photographs and illustrations, and contained in the 1907 book, *The Design Of Walls, Bins, And Grain Elevators*[12], Figure 8. MacDonald was also awarded a US patent in 1917 for a system of elevating the slip forms.

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8 https://www.bookdepository.com/Reinforced-Concrete-Buildings-Ernest-L-Ransome/9780266196648

9 https://en.wikipedia.org/wiki/Packard_Automotive_Plant

10 https://en.wikipedia.org/wiki/Highland_Park_Ford_Plant

11 Adrian Forty, "Concrete and Culture *A Material History"*, 2012, ISBN 978 1 86189 897 5

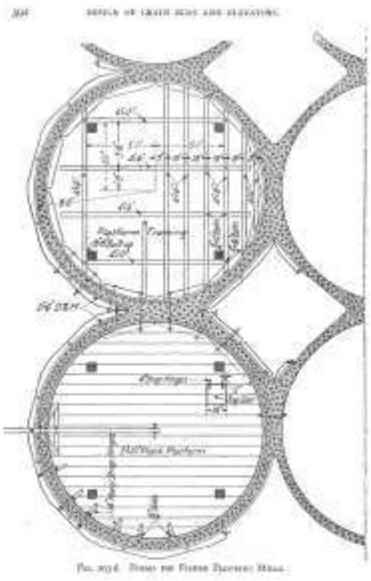

Figure 8: MacDonald Engineering slip-formed bin illustration from *The Design Of Walls, Bins, And Grain Elevators by* Milo Smith Ketchum, 1907, 2nd Ed 1910.

Floyd would certainly have been aware of this type of construction overseeing the construction of the original cement made silos at the Kandos works, Figure 9.

Figure 9: Concrete cement silos at the Kandos Cement works, part of the original works development in 1910's which were constructed using the slip-form method. ***Photo Karon Grant 2014***

There is also evidence in the church's construction where a simple slip form technique was used to construct the "8 poles" of the nave, Figure 10. The use of slip-form technique may have been a simple on-site

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[12] A download of *The Design Of Walls, Bins, And Grain Elevators* is available at http://brittlebooks.library.illinois.edu/brittlebooks_open/Books2009-08/ketcmi0001deswal/ketcmi0001deswal.pdf

convenience, but it also an opportunity to demonstrate the new, modern construction techniques using the new, modern material in a non-industrial setting.

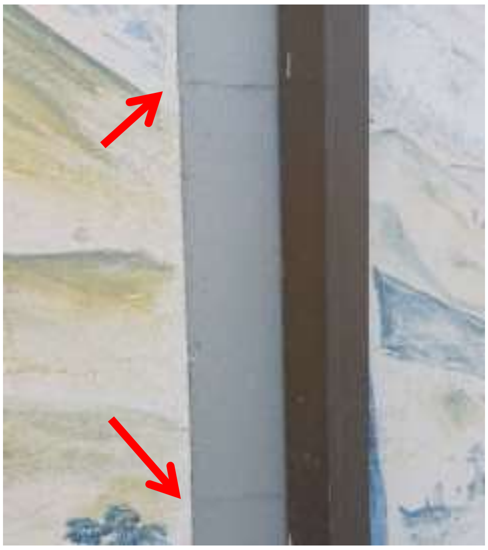

Figure 10: Section of one of the "8 poles" of the nave constructed on-site using slip-form technique showing witness marks to successive pours to form a column of 16" (400mm) diameter. *Photo credit Kandos Museum 2022*.

For a building of the size of the church it is more economic now, as it was then, to top the building using a timber structure, either pitched or flat, and then finished with sheeting. Economy was not the motivation for the choice of roof system but rather style and purpose, Figure 11.

Figure11: The western wall of the nave showing the "eave" of the concrete roof. The roof drained through ports in the parapet where the water was simply allowed to fall from the eave edge. *Photo credit Kandos Museum 2022*.

The late 19th Century saw renewed interest in the architecture of the Spanish Mission buildings of the South West and California. This interest became known as the Mission Revival[13]. The style was fashionable, it was new and it was being built in California in the decades immediately before Floyd came to Kandos and would have been part of Floyd's visual language. Kandos does have examples of Mission Revival architecture, the most notable being the Convent, in Fleming Street.
But the church that Floyd built is not "Spanish Mission", it contains few of the decorative features of the style, only the semi-engaged tower and the high set windows are reminiscent of the style. The building reflects the subdued tastes of the Methodist movement, equally it reflect another sensibility; that of the engineer and the aesthetics of the "well resolved primary structure" exemplified 10 or so years later on by Swiss engineer Maillart[14] in his bridges and warehouses.

It is doubted that it reflects a lack of resources Floyd being the man "on the spot", bringing the cement works to life and in command of the very essence of Kandos.

Was there another purpose to the building, a purpose that could not be fulfilled by the roof being constructed using materials other than concrete?

Indubitably yes. The Kandos Methodist Church was a demonstration building, a demonstration of the new material that Kandos was producing and a demonstration of the new construction techniques: a demonstration of Modern. It demonstrated to the people of Kandos and surrounds all those things, and it demonstrated those things to potential users of cement. And it did this in a context, in a vernacular that scoffed at the idea that the new materials and techniques were of interest only to industry, a church.

Floyd S. Richards came to Kandos to build a cement plant for NSW Cement, Lime and Coal Co Ltd but he built more. In building the Kandos Methodist Church he introduced Modern to Australia in what was, at the time, a far flung part of the world.

The significance of Floyd's Roof is that it is likely to be the first cast in-situ concrete roof in Australia executed using the Ransome System, a method that went on to be the dominant construction method for multi-story buildings both in Australia and around the world.

SCOPE OF WORKS

The works consist of relocating the solar and air-conditioning services, removal of the over-roof, make good of the original concrete roof and to seal and water proof the roof.

RELOCATE THE SOLAR AND AC.

A solar electric generating system was added to the museum's over-roof in 2017. This system will need to be relocated to another part of the roof system. The present orientation of the solar is such that one half of the panels are slope to the east whilst the other half is orientated to the west, Figure 12.

The solar system is to be relocated to the skillion roof to the south of the nave and orientated to the north mounting the panels on "tilt-frames" to better capture the available radiation. This will improve the efficiency of the solar system.

Site inspections indicate that the existing solar system can be accommodated on this roof without undue visual impact and with only minor electrical work.

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[13] https://en.wikipedia.org/wiki/Mission_Revival_architecture

[14] *Sigfried Giedion*. *Time, Space and Architecture*, Harvard University Press. 5th Ed. 1967 pp450-465.

The re-routing of the air-conditioning service lines will require the disconnection and reinstatement of the lines. It is intended to penetrate the south wall of the nave immediately below the capping beam and re-instate the service lines at this level.

The majority of this work can be undertaken using volunteer labour under supervision of the appropriate trade qualified personnel.

REMOVE OVER-ROOF.

It is intended to remove the over-roof by disassembling it into individual components with the sheets and trussed bundled far subsequent removal by crane to the car park area to the east of the nave. The original flat concrete roof provides a safe work platform on which to undertake this work. The dismantling of the over-roof can be undertaken by appropriately supervised volunteer labour.

Figure12: Aerial view of Kandos Museum illustrating works to be undertaken to reveal Floyd's Roof. ***Photo credit Kandos Museum 2019.***

CLEAN, MAKE GOOD AND SEAL

The surface of the concrete roof is to be cleaned using a water jet washer to remove the accumulated dust, bird droppings and other loose material.

The surface is then to be patched as required and levelled so as to drain to the eave edge as originally intended. This is to be undertaken using a high density self-levelling screed such as Dingo self-levelling cement[15]. This work to be undertaken by a suitably qualified building contractor.

The finished surface is to be sealed using a two coat system of first an epoxy primer, Durotech Hibuild WBE[16], and finished with a mastic sealer, Durotech Mastic AC[17] providing a non-slip surface suitable for light pedestrian traffic.

[15] https://dingocement.com.au/product/dingo-self-levelling-cement

[16] https://www.durotechindustries.com.au/products/detail/duromix-hibuild-wbe

[17] https://www.durotechindustries.com.au/products/detail/duromastic-ac

PROJECT BUDGET

The project budget for Floyd's Roof Project is $55000.

The execution of Floyd's Roof project is within the capabilities of the museum's volunteer labour resources with the exception of the qualified trade services of electrician, air conditioning mechanic and crane services. See accompanying spreadsheet.

The budget is composed as:

Floyd's Roof Project Budget	Inc GST	
Duromastic Water proofer	$	7,220.00
Solar Relocation Hardware	$	1,904.00
Leveller/Bog	$	2,600.00
Paint	$	485.00
Paid Services	$	28,270.00
Project Cost, direct	*$*	*40,615.00*
Volunteer Labour	*$*	*14,080.00*
Total Project Value	**$**	**54,695.00**

PROJECTED OUTCOMES

The projected outcomes of the project are of benefit to both the museum as an organization and to the wider community of Kandos.

This project will benefit the museum by reinforcing the museum's story, to more fully engage in the story of how Kandos, and the museum building, played an important role in transforming Australia in the 20th Century. Through this project the Kandos Museum will be able to more fully engage in the visitor economy enhancing the museum's viability and helping to ensure the museum's ability to contribute to the artistic and cultural life of the district.

The wider community will benefit from the project through having an important part of its history more fully revealed with a strengthening of artistic and cultural activities. Through participation in the project the community's sense of purpose and presence will be enhanced and social wellbeing improved. The project will add to the visitor economy with improved visitation to the museum and to the district. The project will provide employment opportunities with local tradespeople and services.

This is project is aligned to the Kandos Museum Strategic Plan.

ABOUT THE AUTHOR

Dr Robert John (Buzz) Sanderson is a senior engineer in private practice. He was awarded an Honours BE in Aeronautical Engineering, UNSW, a PhD in Material Science and Engineering, UNSW and attained an Advanced Diploma in Electrical Engineering. He has extensive experience in computer aided engineering and numerical analysis in the fields of structural dynamics, fluid mechanics and heat transfer and has been involved in automotive and energy sectors. He is Chartered Professional Engineer of 40 years standing and is on the National Engineers Register. He has worked in US, Asia, Europe and locally and for a number of years lived and worked in Michigan. He is a member of the Heritage Committee of the Sydney Division of Engineers Australia. Buzz has been the President of the Kandos Museum Incorporated since its inception in 2014.