Tocal Visitor Centre: A sustainable new use for an old shed

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Abstract
Tocal, a property outside Maitland NSW, has one of Australia’s finest collections of colonial farm buildings dating from the 1820s. Since the 1980s, conservation work on a number of these buildings has brought back to life one of the most amazing colonial farm sites in Australia. The former Hayshed has been adapted as a modern Visitor Centre based on principles of minimising operating costs of the building and incorporating energy-saving measures as extensively as possible. These include: making full use of the building’s northerly orientation; incorporating an innovative heat pump for hot water supply; using recycled timber for floorboards, window frames, and structural elements; insulating the external skin; and maximising natural systems for heating and cooling, supplemented by air conditioning as necessary. Today, Tocal Visitor Centre is a popular venue for functions and conferences because of its magnificent view over the Lagoon and the unique character of the building.

Tocal Homestead and Tocal College, CB Alexander Campus
Tocal Homestead is located 14 kilometres north of Maitland on the Paterson/Dungog road and has one of Australia’s finest collections of colonial farm buildings dating from the 1820s. Within the precinct are Aboriginal stone grindings indicating thousands of years of human occupation and activity at the site. Tocal Homestead is located within Tocal College, CB Alexander Campus. The College is part of the Tocal Agricultural Centre – a Centre of Excellence within Industry & Investment NSW (I&I NSW). The CB Alexander Foundation supports agricultural education at Tocal College and holds in perpetuity the Tocal lands and resources. The Foundation is responsible for the conservation and development of the historic Tocal Homestead complex. Tocal Homestead is listed on the NSW State Heritage Register.

The Visitor Centre was developed to support the Homestead precinct which is open to the public. The story of the adaptation of the Hayshed to a Visitor Centre is one of care, of retention of fabric, and of the application of sound conservation principles.

Figure 1. Bird’s eye view showing the Visitor Centre (29) in relation to other buildings in the historic Tocal Homestead Complex (Source: Tocal Archives)
This article discusses in some detail the design and all aspects of the adaptive reuse of the Hayshed in the process of creating a first class visitor and function centre.

A history of Tocal

Tocal is on lands formerly inhabited by the Gringai clan of the Wonnarua people. The name ‘Tocal’ is a Koori word meaning ‘plenty’. Agriculture began at Tocal in 1822 when James Webber took up the property as one of the first land grants in the Paterson Valley. Webber experimented with tobacco, hops, grapes, beef and dairy cattle, horses, and merino sheep in these early years.

In 1834 Webber sold Tocal to Caleb Wilson and his son, Felix. Built in 1841, the main house is one of the classic houses of Australia and is the centrepiece of a set of buildings that comprise the Tocal heritage precinct listed on the Register of the National Estate and subject to a Permanent Conservation order. Charles Reynolds leased the property in 1844. During the next 82 years, the Reynolds family ran Tocal as one of the most important Hereford, Devon, and thoroughbred studs in the country. Frank Reynolds (Charles’ son) purchased Tocal from the Wilson family in 1907. In 1926, Jane Alexander and her siblings purchased Tocal from the Reynolds family. The elderly Alexander family at Tocal consisted of Jane (known as Jean), Isabella, Robert, and Charles. By 1939 only Charles remained in residence, tended by his two nieces, Myrtle and Marguerita Curtis. Charles died in 1947.

Alexander left a very large estate and his Will detailed an intention that his estate be used to help orphan and destitute children by training them for agricultural careers. In 1963 the Presbyterian Church was awarded Alexander’s Estate under a proposal developed by Edward Alan Hunt, law agent for the Church. The Church commissioned Ian McKay and Philip Cox architects to design the College buildings, and in 1965 Sir Robert Menzies opened the CB Alexander Presbyterian Agricultural College. The Church managed the College until 1970 when it was transferred to the State of NSW as the CB Alexander Agricultural College, Tocal. This coincided with the passing of the CB Alexander Foundation Act, 1969. Tocal has increased in size to 2,200 hectares through the purchase of adjacent properties.

The Tocal Hayshed

The Hayshed that was converted to the Visitor Centre was probably built just after 1907 when the Reynolds family purchased Tocal. It was built to store the loose hay grown on the flats and carted up using a horse and wagon. The Alexanders did not make much use of the Tocal outbuildings, so the shed remained under-used for much of the twentieth century. By the 1980s the roof was quite rusty and, to some, an eyesore. Funding was secured for a new Zincalume roof but the original cladding on the sides remained.

The Tocal Hayshed had a number of distinct advantages for adaptation to a visitor centre. It is separated from the main Homestead complex, allowing for activities to occur independently of the Homestead whilst enabling the facility to service both the College and the Homestead needs for a visitor centre. The Hayshed has views to the north and south toward the College and the Homestead, and the northern orientation lends the space to glazing at the front. The building was large enough to accommodate a range of activities and functions such as weddings. Although the building has a lesser heritage value compared with other buildings at the Homestead, this allows greater potential for adaptation without impacting on the significance of the shed or the precinct. The Hayshed is prominent in the landscape and quite visible from the main road, with easy access for vehicles and with adjacent stockyards that could be adapted for car parking.

The design

The project presented a unique opportunity for the Homestead to have a world class Visitor Centre. The CB Alexander Foundation was enthusiastic for a high quality facility and aware that it may take some time to construct. One of the features of Tocal is its unique buildings and construction techniques, regardless of whether they were constructed in 1825 or 1965. This building, although being adapted in 2000, was to be no different.

The brief that evolved over a two to three year period sought to provide a facility that would meet a number of criteria. The facility needed to be flexible, robust, safe, easily accessible by people with disabilities, and be suited to a variety of functions and activities involving young, exuberant children as well as the elderly. It needed to cater for at least two coach groups at a time as well as some casual travellers, and be comfortable regardless of the weather conditions. Furthermore, it was necessary for the Centre to be designed for operation by one person who could collect entry fees, provide food services and souvenirs – all in the one location. The design and fabric needed to blend into the landscape with the exterior of the building showing minimal evidence of change, reflecting the feel of a farm shed whilst embodying good design and avoiding the introduction of materials or details in public areas that were not already used in the precinct. An important criterion was that the building must be sustainable with high energy efficiency – a theme pursued vigorously in the project. And finally the design needed to be easy to clean and service and have a low cost of operation, as it would operate on relatively low margins.

The final design includes a main floor, mezzanine, and basement. The north wall and part of the roof was glazed to maximise the environmental benefits of the northerly exposure.

Challenges

Converting the Hayshed posed a number of challenges. These included retaining the character of the internal design, reusing original materials wherever possible, incorporating glazing, incorporating insulation and methods of climate control, and disposing of waste water.
Structural design

The structural design of the mezzanine level posed one of the greatest challenges. With a span of over seven metres the mezzanine required careful design to meet the strength requirements while minimising the bulk of the structure. While steel was considered, timber was chosen to maintain consistency with the fabric of the original building and other buildings across the heritage precinct.

The timber for the joists required 7.2 metre lengths at structural grade F27. The best option was seasoned second-hand timber, which is easy to install, and would not shrink to the extent of new timber. However the required lengths proved impossible to source. The only option was to use new timber despite its disadvantage of shrinking. Again, it proved impossible to source this timber as there are no kilns long enough to accommodate 7.2 metre lengths. As a consequence the timber was purchased green and dried on site using a temporary solar kiln.

The joists for the main floor were 6.9 metres long and were supplied kiln dried.

Stabilising the building

The Hayshed had been well built, but time and weather had taken their toll. The building had no gutters (except on the southern exit) so all rain water from the roof fell to the base of the exterior posts. As a result, the bases of most exterior posts were rotten. All the exterior posts needed new bases spliced into them and those along the northern side required total replacement. Fortunately, all of the posts within the shed were in excellent condition. New posts were installed using a backhoe to dig the remaining post out completely. Existing posts had a new base added under the propped post to enable adequate support down to the basement level.

Included in the stabilisation was the use of steel cross bracing in a number of sections of the shed similar to that used in other buildings in the precinct. These were manufactured in the old Blacksmith’s Shop at the rear of the Homestead.

Excavation

The building is sited on a clay soil, overlaying sandstone into which the new basement was excavated. This was achieved using a backhoe and hammer; the spoil was removed with a bobcat, as larger machinery could not manoeuvre in the restricted area available. At the east end the density of rock was such that a 30 tonne rock hammer was required.

The exposure of the soil profiles and rocks in the basement proved of interest and a small nest of fossils around one rock was found and kept. Consideration was given to placing a glass panel in the basement wall to exhibit the soil profile, however, the problems of condensation and mould make this impractical, so the area was photographically recorded.

Installation of internal structural timber

A front-end loader lifted the bearers into place and transported the joists. Attention to detail was essential in positioning, especially where they joined the side and rear walls of the shed. As the shed was not square it needed creative design to fit the new structure into the building. Floor bearers were bolted to the posts and then the joists housed into each of the bearers.

Flooring

The desire was to use recycled timber flooring for the interior of the shed. During the project the Honeysuckle Wool Stores in Newcastle were demolished and sufficient amounts of the timber was purchased and recycled into floorboards. 225 mm x 25 mm tongue and groove Blackbutt boards were cut for the main floor and 225 mm x 13 mm tongue and groove boards for the mezzanine. The mezzanine boards are glued onto a structural ply sub-floor that braces the mezzanine. The floorboards for the main floor are nailed conventionally.

Timber treatment

There is no preservative treatment of the timber in most of the other farm buildings, so much of the structural timber in the Visitor Centre remains untreated. The Blackbutt flooring, however, was treated with three coats of tung oil and allowed to cure for about a month before extensive use. Exposed timber elements were treated with Caldec timber preservative (handrails and some other elements) and the deck of the exterior ramp was treated with lanolin.

In June 1998 a severe windstorm swept across the Tocal property uprooting a large number of Spotted Gum and other trees. The useable timber from these trees was salvaged and used throughout the centre. A large Ironbark tree was used for the bearers of the rear ramp and many of the wall battens are Spotted Gum from the property. Some of this timber has also been used for structural and support work during the construction of the centre. This timber was sawn on the property, using a portable sawmill.

Windows and glass

The most difficult elements in the design for the whole project were the windows and glass. This was because of the unique nature of the project and the specific requirements for the building’s performance. The building had to provide year-round comfort in a design that required an entire wall of the building and a section of the roof to be glazed. The glazed section of the roof reflects an important heritage element of the building. The original hayshed was built with a section of the northern roof left open (refer to Figure 2) to enable the large, high loads of hay on wagons to enter the shed. Glazing of this section has to be energy efficient yet allow the interpretation of this open section of the roof. The initial concept was to double-glaze the building.
but advice suggested that double-glazing would be effective in winter, but a disadvantage in summer. The final specification used single glazing with louvres at the base of the glass wall and ventilation in the roof apex. This confirmed a concept proposed by the architects who also suggested investigation of glass types for the roof section and the walls.

The glass for the vertical windows needed assessment before the high performance glass could be installed. It was noted that high performance glass must be either in full shade or full sun as variation will cause the glass to crack. After a thermal assessment it was apparent that it would only be possible to install standard grey glass for the front windows. The timber for the front windows is Western Australian Karri. The head and sills are 9 metre lengths, which enabled one span across the front of the building on each side of the doors. This was an advantage both visually and structurally. Karri was a suitable timber for this site as it was set back on the north side of the building and would not get excessively wet. Ironbark, which has a higher durability, was used for the more exposed southern window.

The construction of the roof window proved problematic as well. The intent was to try to have the window fabricated locally to reduce cartage and enable maintenance to be managed easily. The window is an aluminium frame section in which panes can be replaced readily. The most efficient glass would be a mirror finish but this was not visually acceptable for the building. The final decision was to use a tinted 12.38 mm thick high performance glass. Heat is absorbed into the glass and reflected rather than entering the building.

**Roof blinds**

The section of glass roof required shading to manage summer glare and heat. Blinds with an electric operation system were installed. The weight of the glass roof and blind required a structural review of the design of this section of the roof.

**Roof and insulation**

To provide adequate thermal insulation, a roof was constructed over the existing corrugated iron with a metal Z purlin used as a batten. This provided a 100 mm gap for insulation.

An important aspect of the design concept was to retain the original interior. The early 1990s Zincalume cladding was inappropriate for the precinct. Short sheets of corrugated galvanised iron, the original roof material, were reinstated.

Another consideration was sound insulation. A large iron building with a timber floor and a crowd of people can create unacceptably noisy conditions. Perforated corrugated galvanised iron was used for the ceiling to provide sound insulation (Figure 4). To achieve a patina to reflect the old corrugated material, the new sheets were dulled by treatment with weak acid.

The design of the new roofing presented two problems: visibility through the perforated metal and condensation. As the perforated iron is slightly see-through, a hessian backing was added as a visual screen and to assist in acoustic performance. Normally foil is installed on the underside of the thermal barrier, but in this case the foil would reflect sound and make the sound barrier ineffective. Mylar, a synthetic material, was installed, which was both moisture proof and maintained the acoustic properties.

**Walls**

For conservation reasons it was also felt that the internal walls should be left intact, so visitors could experience the original interior of the old shed. A frame of 50 x 100 mm hardwood battens on edge was constructed over the original corrugated iron. The walls were then clad with corrugated galvanized metal so the original form and material could be appreciated. Thermal insulation batts and a vapour barrier were installed in the cavity.

Original photographs show splayed weatherboards on each end of the gable of the building, but these had been replaced by corrugated iron. Tallowwood splayed weatherboards were reinstated. Vents for fans were installed in each gable.

**Staircase**

The internal staircase was constructed with Blackbutt timbers, off cuts from the structural work. The railing design included the use of wire cables to simulate a plain wire fence. These were tightened using roller strainers commonly used in early Homestead wire fences.

**Mezzanine**

The balustrade for the mezzanine included a side fence and safety rail. The top rail was an Ironbark sapling, as commonly used on stockyards, with rabbit-proof netting infill. This reflected the history of fencing at Tocal with rabbit-proof netting by Charles Alexander following the family’s purchase of the property in the 1920s.

The netting for the mezzanine (found in one of the Tocal sheds, possibly left over from a fencing project in the early twentieth century) was installed down the side of the mezzanine to the bearer and secured with a piece of hardwood timber to simulate the netting being dug into the ground – necessary in practice to keep rabbits out. The same detail was used for the access ramp into the building but here new netting was used.

**Other energy considerations**

The design concept needed to include minimising the operating costs of the building, even if this involved higher capital costs. This has been achieved by making full use of the northern sun through glazing. A heat pump system was installed to provide hot water (which was innovative at the time) and requires little energy to operate.

The building includes low-level louvres on the north side and high-level exhaust fans in each end to maintain cross ventilation.
Visitor Centre project provided an opportunity to not only update the Homestead waste water system but also that of the adjacent Tea Rooms. A long-term design was developed for the whole area that allowed for piping of wastewater from these buildings to a pumping station south of the (Hayshed) stockyards and to also collect wastewater from the Visitor Centre and pump it across to the College treatment works. This proved to be a massive project, which was completed in early 2002.

Conclusion
This project was undertaken over three years to enable matching with available cash flow and produce good conservation objectives without the pressure of time. Solid research preceded each detail and phase of the project with overarching objectives of energy conservation and heritage fundamental to all decisions.

The extensive use of local skills and knowledge, supplemented where necessary with professional input, has resulted in an innovative and successful outcome greatly appreciated by the local community, which has a strong affinity with the facility. It is widely sought after as a venue for functions and has twice been awarded the best function centre in the Hunter Valley.

References

As the building had to be comfortable in all seasons for all users, it was resolved to fully air-condition the building as a managed back up system. Air conditioning systems can require extensive ducting which can become intrusive. To minimise visual impact, the final design involved a series of five split system units (two on the main floor and three on the mezzanine level). To ensure the heritage considerations were respected, the internal units were concealed between the joists and pipe work carefully concealed between joist and timber battens. The end result is a building designed to operate using natural systems, with air conditioning only being used as a backup.

Mechanical and electrical designs
All the services in the building require extensive switching and controls. These are located on a central control board. All wiring and cabling is contained in the skin of the building between the two layers of corrugated iron. Dark fibre-covered electrical cable was used for the lights while the fans were sprayed with grey paint to make them less intrusive.

Waste water design and construction
The Homestead site is almost one kilometre north of the College campus. A new wastewater plant was installed for the campus about 10 years ago, with a capacity in excess of existing needs. This was done with expansion in mind and to cater for the Visitor Centre. The Homestead had an antiquated septic tank. The Figure 5. Ceiling detail of main space (Source: Tocal Archives)