

SUBTROPICAL DESIGN MULTI-UNIT DWELLING CASE STUDY

TORBRECK HOME UNITS



Centre for Subtropical Design

Charmaine Kai

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BACKGROUND

Completed in 1960, Torbreck, a home unit building designed by architects Aubrey Job and Robert Froud was Queensland's first high-rise mixed use apartment development. Located on the prominent crest of Highgate Hill, Torbreck is a landmark building visible from many places in Brisbane. It comprises of two reinforced concrete and brick buildings on a one and a half acre site which slopes steeply to the north. The taller building is the Tower Block which addresses and is accessed from Dornoch Terrace. It sits on a permeable concrete podium of garages and storage areas, and is crowned by a glazed observation room. The Tower Block links at foyer level to the top floor of the Garden Block. The Garden Block fronts onto a large landscaped area of trees, lawn and a pool and is accessed from Chermside Street. The stepping of the buildings on the site optimises the northerly aspect, views and minimises site impact.

The Garden Block was the first building in Queensland to be constructed using the 'lift slab' construction. Each slab was hydraulically jacked into position on top of steel columns which became permanent supports.¹

The 1950's saw climatic design become an influential concern for the built environment.² As a result of further understanding and development of climatic design strategies suitable for subtropical climates, orientation, sunshading and passive ventilation became integral with building design. Climatic adaptation of buildings with large window and door openings was required for suitability and acceptance in Queensland's subtropical climate. During the 1950's, architectural devices such as large roof overhangs and vertical sunshading fins were adopted to mediate the solar radiation. Sunshading blades were attached to the exterior of glazed windows and doors, to protect the openings from direct heat gain from sunlight.

Prior to the 1950's, Thurlow's external timber blinds were commonly used to shade windows and verandahs. However, the aesthetics of the timber blinds were not suitable for the minimalist modern houses and buildings of the 1950's.³ At Torbreck, new external shading device was designed to meet the aesthetic and sunshading requirements. Large metal aerofoil shaped blades were arranged to form adjustable louvres. The louvres were positioned vertically at the exterior of the building to shade the window and door openings behind. This created interest and variation to the exterior of the building. The sunshading fins protected the interior from direct sun access and provided passive wind control and privacy. The metal louvre blades were painted or pre-colour coated. In the 1950's and 1960's vertical fins were commonly used on city high rise buildings in Brisbane to protect the glazed walls behind from the sun.

Torbreck used blue pre-colour coated metal louvres fixed vertically to protect the central balconies in the tower block from the eastern and western sun. The louvres are fixed between floor and ceiling on each floor of the tower unit levels and become a feature of the tower design. The adjustable vertical sun fins create dynamic random patterns of colour and texture on the eastern and western façade as tenants reposition the blades according to individual requirements for light and ventilation.

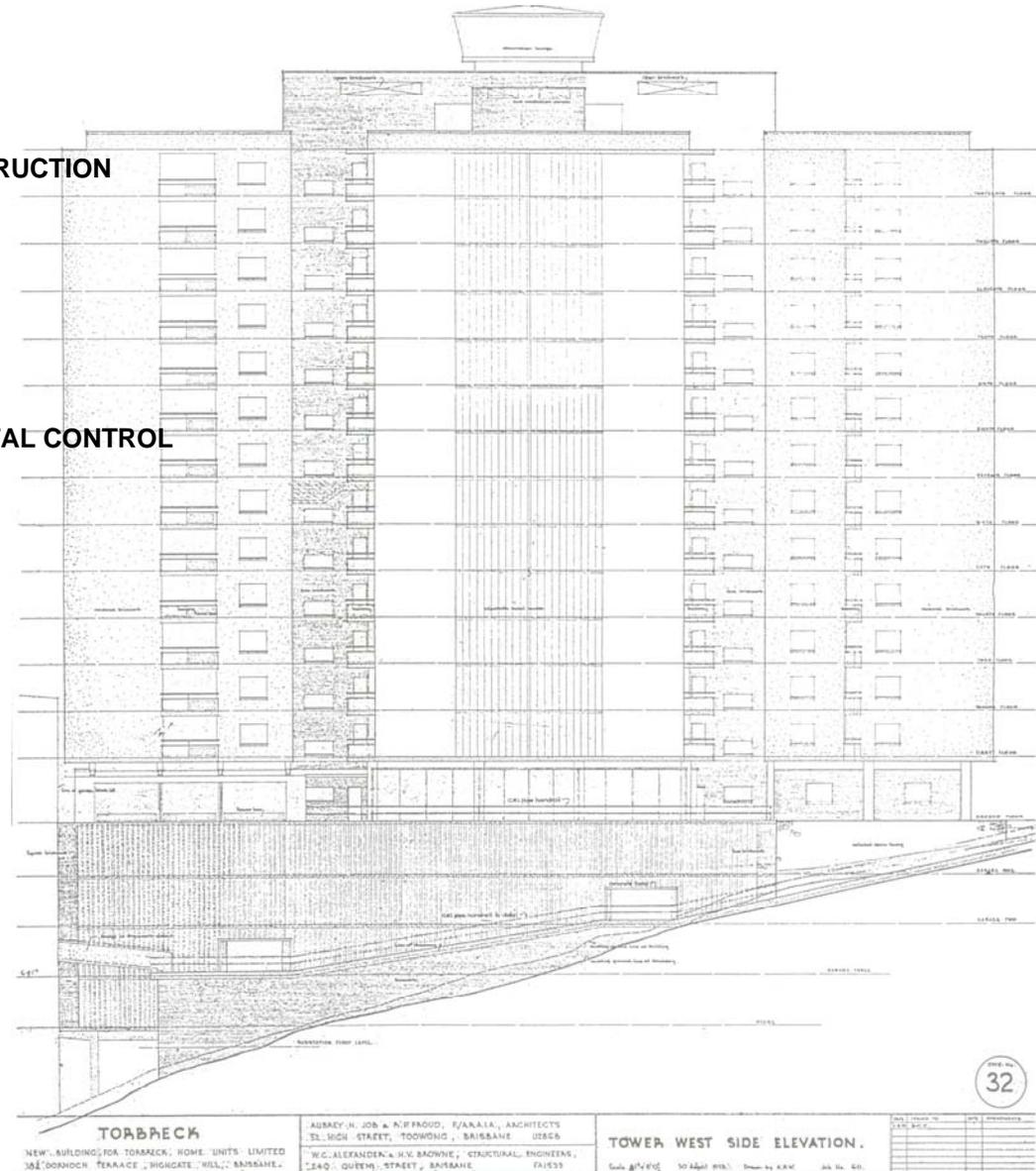
The original concept included a mixed use development with shops and a restaurant on the ground floor of the complex but was not built due to difficulty obtaining approval from Brisbane City Council and finance. Instead of the shops and restaurant on the ground floor of the Tower Block, residential units in a configuration similar to the other units in the Tower Block were constructed. The roof garden originally planned for the top of the Tower Block was also abandoned due to rising construction costs.⁴ The building created a precedent for multi-storey residential buildings in Brisbane.

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1. DEVELOPMENT DESCRIPTION

LOCATION

Site Address: 182 Dornoch Terrace, Highgate Hill, Queensland

Region: South East Queensland

Heritage: Queensland State and Brisbane City Council Heritage Listing

DESCRIPTION

Type of Development:	Residential High Rise
Land Area (m2):	6521m ² (approx.)
Site Cover (m2)	1749.15m ² (approx)
Landscape + External Area	4320.85m ² (approx)
Building Area (m2):	19892.78m² total (approx)
Plot Ratio:	3.05
Garden Block	4253.2m² total (approx)
Garage	± 531.65m ²
Internal Area	± 2653m ²
Balconies + External Walkways	± 1068.55m ²
Tower Block	15 639.58m² (approx)
Garage	± 3150m ²
Internal Area	± 9909.425m ²
Balconies + Terraces	± 2517.345m ²
Observation Deck	± 62.81m ²
No of storeys:	23 storeys total
Garden Block	8 storeys total (7 unit levels + 1 garage level)
Tower Block	18 storeys total (14 unit levels + 3 garage levels + 1 basement level)
Roof Top Plant	1 storey
Observation Deck	1 storey
No of Units:	147 units total
Garden Block	49 units
Tower Block	98 units
Dwelling Units per ha	92 dwelling units per ha
Cost:	£1,200,000 (Equivalent to \$25,800,000 in 2005)
Year of Completion:	1960

PROJECT OWNER

Original owner of the project was Mr Rowley Pym who later sold to Mr Noel Kratzmann.

Currently under Company Title whereby Homeowners buy a share in the Torbreck Home Unit Company to purchase a right to occupy a unit.

ARCHITECT/DESIGNER

Mr Aubrey Job and Mr Robert Froud

STRUCTURAL ENGINEER

W.C. Alexander and H.V. Browne

BUILDER

Mr Noel Kratzmann

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2. LOCATION AND CLIMATE

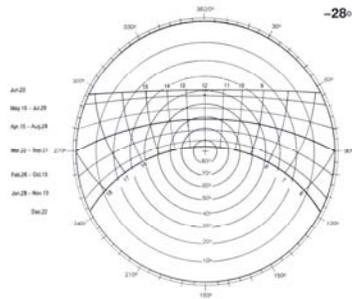
2.1 CLIMATIC AND CONTEXTUAL DATA

Climate:

Torbreck is located at Highgate Hill an inner city suburb of Brisbane, Queensland. Brisbane is located within the subtropical climatic zone which is characterised by hot humid summers and cool dry winters.

Solar Access:

Brisbane's latitude is 27.5° south of the equator. Solar access is predominantly from the north. Morning sun and afternoon sun contributes significantly to solar heat gain during summer.



Sun Diagram for Brisbane⁵

Prevailing Wind:

Summer:

The prevailing winds are predominantly from the south and south-east in the morning. Afternoon winds are from the east and north-east.

WIND FREQUENCY ANALYSIS (in km/h)
BRISBANE AERO STATION NUMBER 040223
Latitude: -27.42° Longitude: 153.11°

9 am Summer
4550 Total Observations (1950 to 2000)

Calm 11%



9am Summer⁶

WIND FREQUENCY ANALYSIS (in km/h)
BRISBANE AERO STATION NUMBER 040223
Latitude: -27.42° Longitude: 153.11°

3 pm Summer
4465 Total Observations (1950 to 2000)

Calm 1%



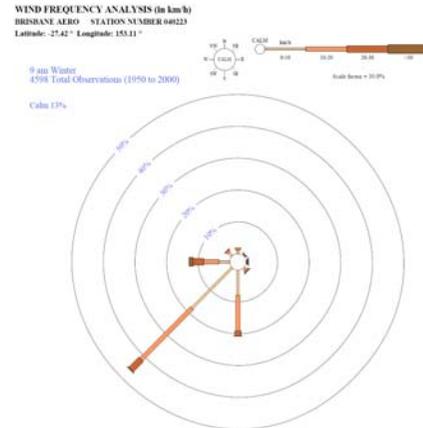
3pm Summer⁷

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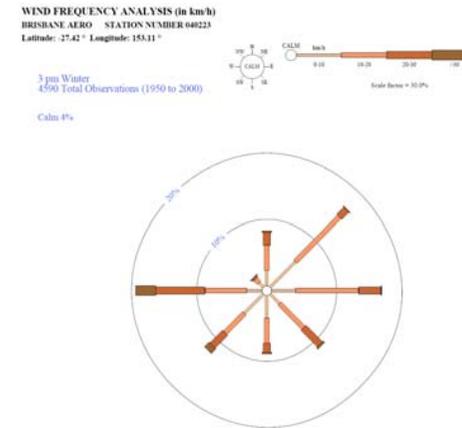
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Winter:

The winter morning winds are predominantly from the south west with the afternoon breezes originating from the north east, east and west.



9am Winter⁸



3pm Winter⁹

Rainfall

Average annual rainfall: Approx 1200mm

Microclimatic Influences



West Elevation of Torbreck¹⁰
View from Highgate Hill park. Large trees and vegetation surround the site.

Vegetation

A lush subtropical garden located on the northern side of the site provides a cool shaded landscape area. Due to the height of the garden block, the vegetation does not shade the building.

Dense vegetation on the western side of the complex cools the immediate area surrounding the building and provides a pleasant outlook. Due to the topography of the site and the height of the building, the vegetation does not shade the western residential portion of the Tower Block. The vegetation surrounding Torbreck tempers the heat island effect.

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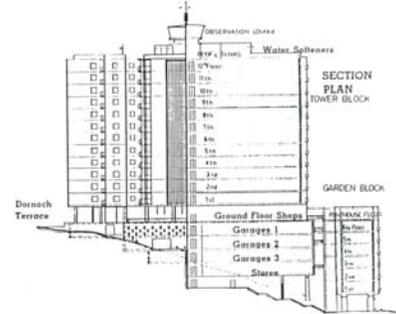


Torbreck from Dornoch Terrace¹¹
Surrounded by large shade trees and detached houses.

Location

Torbreck is located on a prominent ridge at Highgate Hill. The height of the development increases its exposure to the prevailing winds and sun. Immediate surrounding properties are 1-2 storeys high detached houses or located at the base of the ridge.

360° views are available from the site varying from Brisbane's CBD to the north, Moreton Bay to the east, the University of Queensland and southern suburbs to the south and Mt Cootha to the west. Due to the position and height of Torbreck, most of the views are unobstructed.



Section of Torbreck¹²
Cut and fill has been minimised on the site.

Topography

The land falls steeply from south to north. The northern end of the site on Chermshire Street is at the bottom of the hill. The building relates to its surrounding topography and minimises site impact.

Neighbourhood



North East Elevation¹³
Surrounded by detached dwellings.

Adjoining sites consist of one and two storey detached houses and vacant land with established vegetation to the west. Highgate Hill Park is to the west of the site. The surrounding area has a mixture of detached houses, local shops and low rise apartments.



Highgate Hill Park¹⁴

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3. CLIMATE RESPONSIVE BUILDING DESIGN AND CONSTRUCTION

This section discusses the response to orientation and topography through building form and site layout. A summary of design strategies and features and their benefits are given and further explained in detail.

Home units for a subtropical climate require an analysis of the local climatic conditions to produce a design that allows most of the units in the complex desirable aspect. Passive design strategies can be more easily achieved with well orientated units. Integrating passive design strategies with the overall building design produces a building that responds to the climate rather than one which excludes it. This is important as more households are affected in a unit block than a single detached dwelling.

Both the residential tower and the Garden Block demonstrate features that are a direct response to the subtropical climate.

- comfortable external spaces that supplement internal living space,
- comfortable communal spaces created for residents' use,
- designed landscapes that are integral to the overall architectural design,
- single loaded narrow plan width to facilitate cross ventilation and natural light, (Garden Block only)
- sunshading devices that provide sun control during summer,
- sunshading devices that allow solar gain during winter,
- optimum orientation
- angled walls that exclude direct sun yet allow views, natural light and privacy.

The benefits of these features are as follows:

- perception of larger internal living spaces allowing flexibility of use,
- pleasant external communal spaces for larger gatherings and outdoor activities,
- landscaping integral to the design accommodates large shade trees and substantial vegetation reducing the heat island effect,
- natural cross ventilation cools the unit during summer and quickly flushes out hot air,
- natural light reduces the need for electric lighting during the day,
- adjustable sunshading devices provide sunshading, control breezes and views during summer and allow solar access during winter. This reduces the need for electrical appliances that the heat and cool the unit during winter and summer respectively.

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ORIENTATION, LAYOUT AND BUILDING FORM

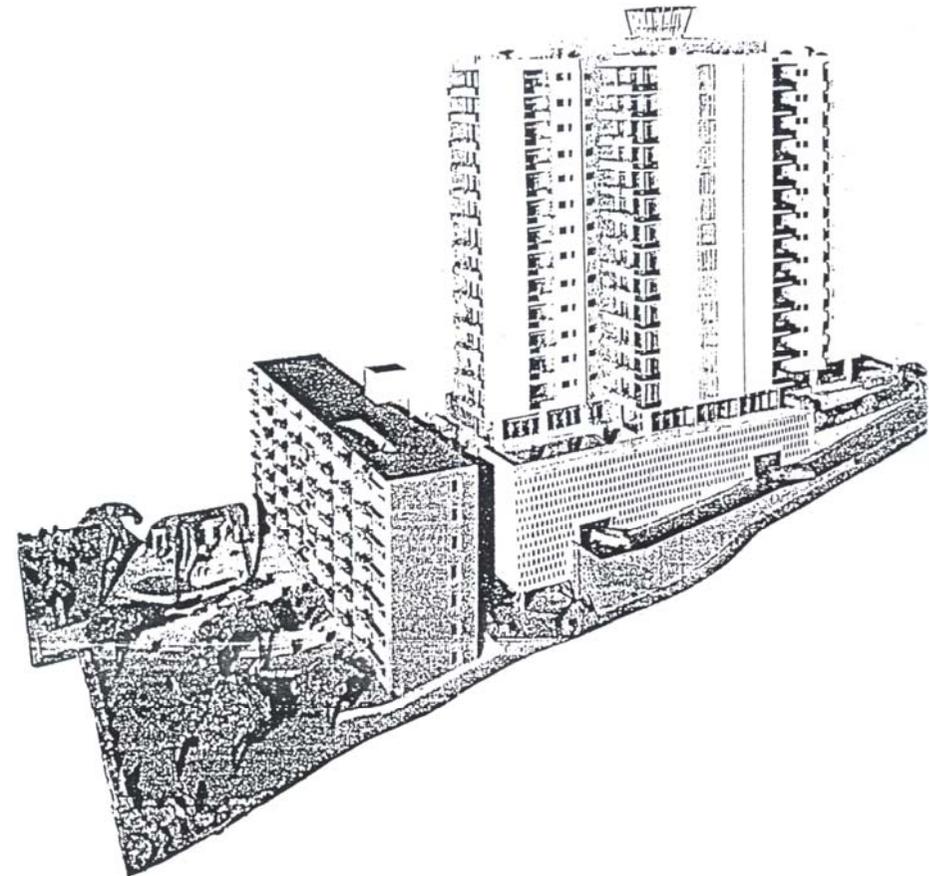
3.1 ORIENTATION

Garden Block on lower slope with long elevation facing north. Tower block with balconies facing north and south. The Tower Block and the Garden Block opens up towards the south and north and employs more defensive strategies on its eastern and western elevations without compromising views.

Carparking is located at base of Tower Block to minimise cut and fill on site. A gap between the two blocks allows light and ventilation to the south face of the Garden Block. Landscaping to the front of the Garden Block helps to temper the environment and provide 'cool paths' to the building for natural ventilation.

This contrasts with the current practice of paving the majority of external open spaces for carparking or circulation.

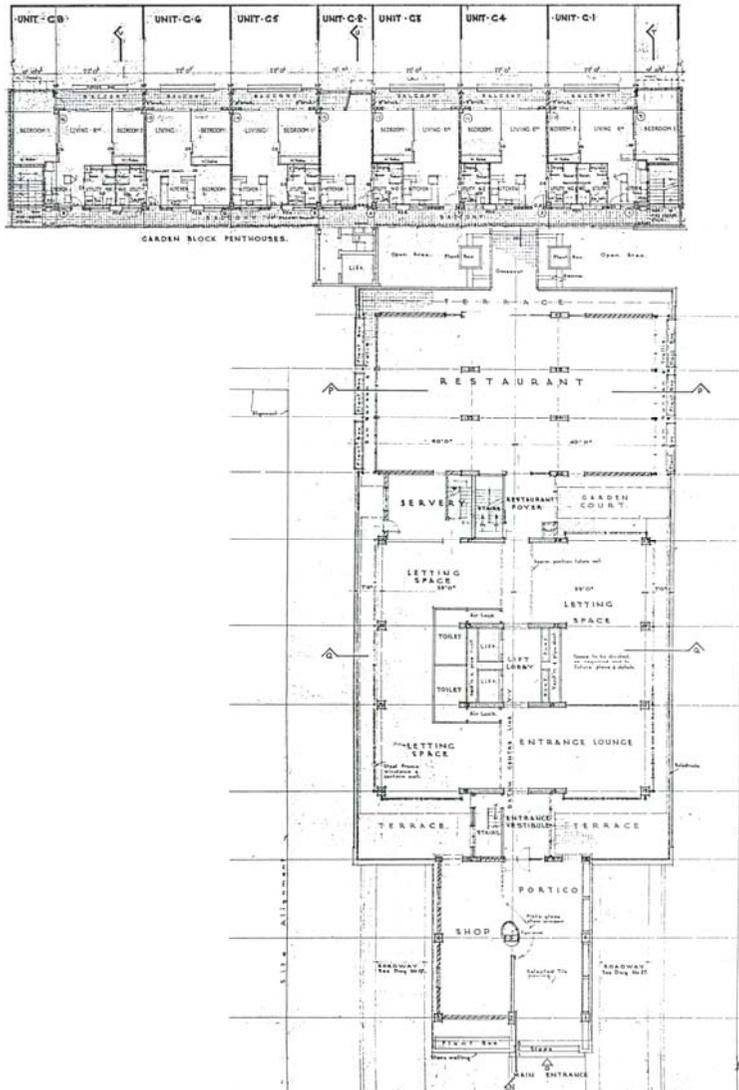
In terms of plot ratio and site cover, Torbreck contrasts with current practice where the majority of the site is covered with building and small unusable spaces are left for landscaping. The landscape communal area in front of the Garden Block is well over 2000m². Despite having a large landscaped recreational area, Torbreck achieves a plot ratio of 3.05.



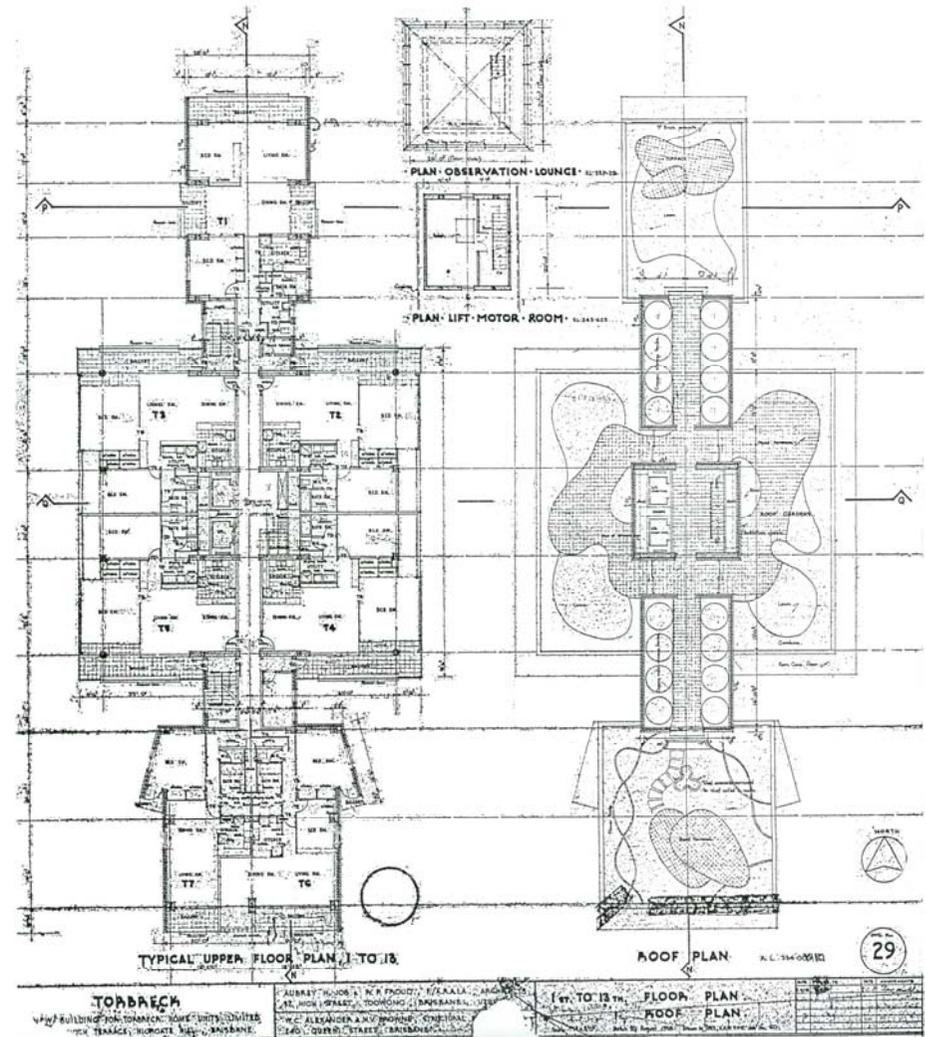
View of Torbreck from North West¹⁵

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Torbreck Floor Plan¹⁶



Tower Block Plan and Roof Plan¹⁷

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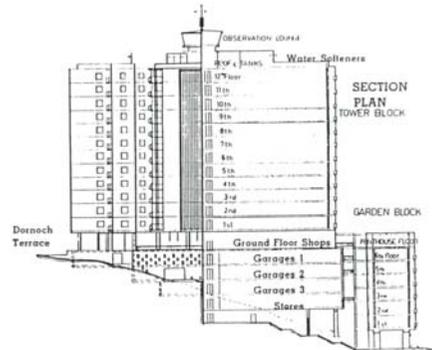


Northern views to Brisbane's CBD¹⁸
Established landscape garden adjacent to the Garden Block is seen in the foreground.

To take advantage of the steeply sloping topography and orientation, the design of Torbreck consists of two steel framed and reinforced concrete buildings. A lower Garden Block with its long edge facing north and a high rise Tower block which is orientated with its long edge facing east and west. The two buildings are linked at foyer level.

The orientation of the development takes advantage of surrounding views and climatic influences such as prevailing breezes and solar access, so that all units have desirable aspect. This produces a design that responds to the conditions of the site and provides residents with comfortable units suited for the subtropical climate.

3.2 SITING AND LAYOUT



Site disturbance is minimised on the steeply sloping site¹⁹

To reduce the impact of building on the steeply sloping site, two separate buildings were built and linked by a walkway above ground level. Carparking for the tower block is located further down the slope of the site and minimises the extent of cut and fill by being above ground. This strategy also allows natural ventilation to the garages. At the same time, the location of the garages below street level ensures the street is not dominated by a bulky parking podium.

The location of the Garden Block at the bottom of the hill minimised the extent of cut and fill and allows natural light and ventilation to reach the southern side of the Garden Block.

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Chermside Street Entrance²⁰
Shaded landscape entrance of the Garden Block creates inviting street appeal.

The entrance from Chermside Street provides a shady landscaped garden that provides a transition between the street and the Garden Block. Large shade trees overhang the driveway on site and over Chermside Street. Mature vegetation assists in moderating the heat island effect by cooling the paved surfaces.

The development has a large bike storage area to accommodate residents who cycle regularly. Residents take advantage of Torbreck's proximity to Brisbane's CBD and local universities by cycling, walking or taking public transport.

3.3 BUILDING FORM



West elevation of Torbreck from Highgate Hill Park²¹

The external form of the Tower Block comprises of two vertical wings projecting out north and south from a square central core. The central core houses a unit in each quadrant and projects east and west from the building. Apartments have full length verandahs to the north and south, and balconies facing east and west. The balconies on the eastern and western wings have full height vertical blue steel louvres framed by textured concrete panels. The observation deck at the top of the tower provides uninterrupted views of Brisbane and its surroundings. The Dornoch Terrace entrance within the Tower Block comprises of a protected recessed entry. This entrance is connected through the Tower's lobby to an external concrete bridge and a covered concrete viewing terrace on the top storey of the Garden Block.²²

The Garden Block is a long, narrow, rectangular building with private balconies to the north and sheltered walkway access to the south. The Garden Block overlooks a substantial landscaped garden to the north with large shade trees and a pool. The Garden Block has solid brick walls to the east and west to minimise exposure to the eastern and western sun. The external brickwork on Torbreck is patterned and textured with projecting bricks to create visual interest. The Garden Block is accessed from Chermside Street via a sheltered foyer in the undercroft.



Link between the Tower Block and Garden Block²³

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Unit balcony in Garden Block²⁴
Covered balcony provides protection to full height sliding doors.

Balconies

Each unit in the tower and garden blocks has one or more balconies. The balconies feature planter boxes and translucent glass balustrades. In the Tower block, sun control on the east and west balconies are controlled by means of adjustable aluminium louvres. Large glazed openings, mainly in the shaded recesses of the balconies allow views without compromising sun control. The balconies are generally long and narrow which restricts the type of activities on the balconies. In the Garden Block, the balconies provide shading to the large window and door openings which are effective in shading northern solar access.



South East balconies on the Tower Block²⁵

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Coloured tile walkways differentiate the levels.²⁶

Construction

The dividing walls between the individual units are solid brick and reinforced concrete with painted plaster finish. Partitions within the units are non-load bearing to enable alterations to be made should future owners desire. The tower block is constructed from reinforced concrete. Each floor has a different coloured floor finish for differentiation.

Roofs are flat using asbestos felt and concrete block finish. This was designed to accommodate the original trafficable roof garden.

Garages

The multi-level garage forms a podium for the tower block. Its position takes advantage of the sloping block to minimise cut and fill and is visually obscured from Dornoch Terrace and Chermerside Street. The external walls of the garage are kept permeable to ventilate car fumes and heat.



Vertical fins allow air flow through the carpark²⁷



The carpark is located below street level and is access via Dornoch Terrace²⁸

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3.4 TOWER BLOCK



Tower Block from Dornoch Terrace²⁹

The seven units on each floor are designed to capture the best aspect for its given location. Natural light and ventilation are encouraged in all unit designs with at least two external walls for each unit. Each unit has northern or southern orientation to assist with capturing breezes and solar access. Defensive measures are taken on eastern and western facing walls and openings to minimise heat gain during summer. External balconies facing north and south provide climatically attuned private external spaces for each unit.



Western view of Type 1 unit³⁰

Large full width balconies face north. Smaller balconies with vertical awnings face east and west. Small windows limit the units exposure to the eastern and western sun.

Tower Unit Type T1 (1517 ft² or 141m²)

This unit is designed to occupy a complete north facing wing, so that the north, east and west sides have external exposure. The overall width of the unit including balconies is approximately 8500mm, which encourages natural light penetration and cross ventilation. Natural ventilation is further enhanced by positioning the large door openings and balconies directly opposite each other in the middle of the unit. The main balcony, main bedroom and living area has exposure to northern aspect. The interior partitions are non-load bearing which enables the owner to vary the internal layout of the unit. The unit can have three bedrooms or two bedrooms and a study.

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Western View of unit type 2-5³¹

Large balconies face north and south. Solid walls and large blue vertical adjustable sunshading fins face east and west to control solar access and breezes.

Tower Unit Type T2-T5 (1347 ft² or 125m²)

Type 2 units are two bedroom units located on each corner of each tower floor. The advantage of the corner position is that each unit has two external walls to maximise natural light and ventilation. The main balcony of each unit faces north or south which provides beneficial aspect. Smaller balconies facing east or west are accessible from both bedrooms and protected from the eastern or western sun by large vertical aluminium louvres. The large blue aluminium fins on the east and west façade of the tower are a dominant feature of the tower design. The amenity and utility areas are kept close to the lift core for serviceability. The disadvantage of the location is that artificial ventilation and lighting are required during the day.

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Southern view of Type T6 unit³²
Large balconies facing south and small bedroom balconies facing south-east.

Tower Unit Type T6 (1325 ft2 or 123m2)

This 2 bedroom unit type has a south easterly aspect. The unit has two external walls and openings in these are designed to provide natural light and ventilation throughout the unit. The narrow width of the unit allows light penetration and natural air circulation. The south facing balcony is accessed from the living and dining room via large sliding glass doors. The main bedroom has a small private balcony with an outlook to the south east. The amenities are located centrally for serviceability. The unit is protected from the western sun by the adjoining unit.

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South-western view of Type T7 unit.³³
Small windows and balconies face west and south-west to minimise heat gain.

Tower Unit Type T7 (1077 ft² or 100m²)

This 1 bedroom unit has a south westerly aspect. The main bedroom in a mirrored location to T6 has a private balcony that faces south west with views towards the University of Queensland. The south facing balcony is accessed from the living room via a glass sliding door. With a narrow floor plan and two external walls, the unit has abundant light and natural ventilation. Openings on the western façade are kept to a minimum to protect the unit from the western sun.

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3.5 GARDEN BLOCK



Garden Block from Chermerside Street ³⁴



Garden Block southern walkway ³⁵
Covered walkway protects unit entries from the weather.

The Garden Block is a long narrow block with its long elevation facing north. Each floor has 7 units with a communal open area on the top floor with views to the city. Every unit within the Garden Block has northern aspect, providing good solar access and natural ventilation. The garden block overlooks established landscaping, including a communal swimming pool. The space between the Garden Block and the Tower block allows natural light to filter through to the southern side of the Garden Block. The gap also allows northerly breezes to pass through the Garden Block and is drawn upwards between the two buildings.

The unit plan depth is narrow at 7.6 metres. External balconies facing north and external walkways facing south add to the unit depth. This makes the total depth of the Garden Block less than 10.5m. By taking advantage of solar access, the narrow depth of the Garden Block allows abundant natural light to penetrate the units and also encourages natural ventilation.

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North Elevation³⁶

Garden Block Unit Type G1 + G8 (900 ft² or 83.5m²)

These two bedroom units are the largest units in the garden block. The bedrooms have views to the city and the living room opens onto the north facing balcony. The units are designed for maximum breeze during summer and solar access during winter. The units are respectively located on the east and west ends of the building. Exposure to the eastern and western sun is blocked by the cavity brick solid facades. The narrow plan depth and location of windows encourage cross ventilation through the unit. Amenities and utilities are located on the southern side of the unit allowing natural light and ventilation into the rooms.



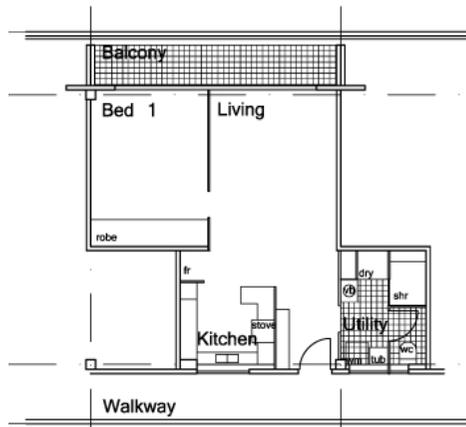
Northern elevation: Type G2 unit in the centre³⁷
Retractable awnings control solar access on north facing balconies.

Garden Block Unit Type G2 (585ft² or 54m²)

The smallest unit in the complex with a north facing sleeping alcove. On alternate floors the sleeping alcove is located on the opposite side of the unit. Adjacent to the sleeping alcove is a small balcony facing north. The open plan living, dining and sleeping area allows light and ventilation to penetrate throughout the unit. Amenities located on the southern side of the unit have access to natural ventilation and light.

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Garden Block Unit Type G3, G4 + G5 (762 ft² or 71m²)

1 bedroom units with northern aspect for the bedroom and living area. Large sliding glass doors from the living room and bedroom open onto the north facing balcony. The open plan living, dining and kitchen allows natural light and ventilation throughout the unit.



Northern Views from the Garden Block overlooking the vegetated common area³⁸

Garden Block Unit Type G6 (854ft² or 79m²)

This unit is similar to G5 but has a second bedroom. The open balcony allows the northerly breezes to pass completely through the unit by way of sliding glass doors and windows.

Torbreck is a proficient example of a subtropical residential development that is suitable to its site, climate and residents by maximising the natural advantages of the site, providing sunshading and louvres and taking advantage of natural breezes and views.

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Northern views to the City from the Garden Block³⁹

Views

North easterly aspect from the Garden Block provides views over the city and Moreton Bay. From the Tower Block, views from the observation deck provide 360° panoramic views of Brisbane.

3.6 CONSTRUCTION

Floor system

The Garden Block was constructed using the lift-slab technique, whereby the roof and floors were prefabricated on the ground, then hoisted into position by jacks mounted on the vertical wall supports. Prior to the construction of Torbreck this technique had not been used in Queensland.

The Tower Block was constructed as a reinforced concrete structure.

External floors are tiled finish in a chequered pattern. Internal floor finish include carpet, vinyl and tiles.

Wall systems



Patterned Bricks to create visual interest⁴⁰

Cavity brick external walls, brick party walls between the units and concrete walls are used throughout the building. The cavity brick walls provide thermal mass and insulation from direct heat gain during summer and provide insulation from heat loss during winter.

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Windows and shading devices



Blue metal louvres control solar access from eastern and western sun.⁴¹

Glass sliding doors and large window openings are protected by balconies, shutters, sunshading fins and awnings. Windows that do not have sun protection are kept to a minimum to reduce the amount of direct solar gain. A distinctive feature of Torbreck is the vertical aluminium louvres to east and west façade of the tower block. The louvres provide sun protection to balconies from eastern and western sun. The adjustable louvres also direct breezes into the units and controls views.

Retractable blue metal awnings are located on northern balconies in the garden block to control northern sun exposure.



Operable windows and louvres control airflow into the unit⁴²

Building Materials

Durability

The materials used in the construction of Torbreck are durable and require minimal upkeep. The brick and concrete structure remains intact and requires little maintenance. The timber framed doors and windows are in good condition as they have been protected from the weather by balconies and awnings.

Maintenance

Ongoing maintenance is an important part of building management. Torbreck has full time maintenance people to keep the building in order which includes a full-time plumber. Items that have been replaced recently include glass balustrade infill and planter boxes to the balconies and the plumbing in the entire complex is being upgraded. The metal balustrade frames have not been replaced. Many of the awnings on the garden block northern balconies have been removed or replaced.

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TORBRECK HOME UNITS

4. BUILDING ENERGY MANAGEMENT AND ENVIRONMENTAL CONTROL

This section discusses passive thermal performance strategies implemented in Torbreck. The passive climatic strategies help to maintain an energy efficient, comfortable residential environment suitable for the subtropical climate.

The thermal performance of Torbreck is perceived by occupants as a climatically appropriate response to the subtropical climate and lifestyle. *“This is the nicest (most comfortable) place I’ve lived in. Cool in summer and warm in winter. The breezes are great.”* Shem Guthrie (resident)

4.1 PASSIVE COOLING AND HEATING

Passive climate control was given detailed consideration during the design phase of the project. This is evident in the design, orientation, layout, materials, fenestration details, sunshading and awnings of Torbreck.

Orientation and the building design on the site have been carefully considered. The form of the design has been influenced by the orientation. The design allows every unit in the complex to have some beneficial aspect and protection from undesirable climatic conditions.

The layout and separation of the building complex into two distinct blocks is an exemplary response to the site and climate. The steepness of the slope would have made a conventional high rise development extremely difficult.

Brick and concrete materials provide thermal mass and insulation during winter and works with passive ventilation strategies in summer to maintain thermal comfort. Fenestration and sunshading are designed to control solar access and natural ventilation.

The initial construction costs for these features are not considerably more than a building without these features. Orientation and layout are inherent within the design and would not cost more to build. Ongoing operational costs are reduced as mechanical ventilation, heating and cooling and electric lighting usage is reduced due to passive climatic features. A benefit of implementing passive climate control in a subtropical development is creating residential buildings that do not rely on mechanical systems for thermal comfort. This provides buildings that are comfortable year round, use less electricity than buildings that require mechanical intervention for thermal comfort and buildings that are cheaper to run by responding to the subtropical climate.

SUBTROPICAL DESIGN MULTI-UNIT DWELLING CASE STUDY

TORBRECK HOME UNITS

4.1.1 Cooling



Operable kitchen windows allow breezes to pass through the unit⁴³

The units in the Garden Block maintain a comfortable temperature during summer and winter. The cavity brick external walls assist in maintaining a consistent temperature and insulates against heat gain during the day. The narrow depth of the units and window positions allow cooling breezes to pass through the unit during summer. The breeze enters the unit from the northern windows; pass through the unit and out the kitchen window and front door. The breeze carrying the hot air is channelled upwards between the Garden Block and the Tower Block.

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TORBRECK HOME UNITS

4.1.2 Heating



North facing sliding doors and operable windows can be closed to keep heat in during winter⁴⁴

The large north facing windows provide solar access during winter. The lower sun angles can penetrate deep within the unit during winter. The small unit size is easier and quicker to heat. The concrete and brick construction provides thermal mass and insulation to keep the heat inside the unit. The windows can be closed to assist in keeping the heat inside.

4.2 PASSIVE VENTILATION



Open front door and kitchen windows allow breezes to pass through the unit.⁴⁵

In the Garden Block large sliding doors to the north and kitchen windows and front door to the south allow breezes to pass through the unit. The breezeway between the tower block and garden block creates a wind channel that channels air upward. Summer breezes enter the unit from the north, pass through the unit, and travel up through the gap between the Tower and Garden block.

SUBTROPICAL DESIGN MULTI-UNIT DWELLING CASE STUDY

TORBRECK HOME UNITS

4.3 NATURAL LIGHT



Natural light entering the unit from large sliding doors facing north⁴⁶

The narrow depth of the building allows excellent natural lighting to penetrate throughout the unit. The northern aspect provides abundant natural light throughout the day.

4.4 HOT WATER HEATING

The units within Torbreck use instantaneous gas hot water units. The instantaneous gas hot water heaters use minimal energy as water is not stored and kept hot when not used. This provides operational savings to energy bills.

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TORBRECK HOME UNITS

5. LANDSCAPE

5.1 COMMON AREAS



South Walkway of Garden Block overlooking vegetation⁴⁷

Landscaped gardens surrounding the Garden Block provide a vegetated outlook from the northern facing balconies of the Garden Block. The gardens off Chermerside Street contain mature landscaping with a common area containing a swimming pool. The vegetation on the south side of the Garden Block provides a pleasant outlook from the external walkway.



South elevation with planter boxes on balconies⁴⁸

Each unit within Torbreck has at least one large balcony that has built in planter boxes to encourage vegetation within every unit. The success of the planter boxes is unknown although most planter boxes contain some vegetation. It is unknown whether the planter boxes are filled with potted plants or other items. The planter boxes are large enough to grow medium size plants as seen by the bougainvilleas in the photo below.



North elevation with planter boxes on balconies⁴⁹

SUBTROPICAL DESIGN MULTI-UNIT DWELLING CASE STUDY

TORBRECK HOME UNITS



Common Area on the 7th floor of the Garden Block⁵⁰

A semi enclosed covered common area on the 7th floor of Garden Block has views of the City and can be used as a public gathering space for residents. This is an example of an indoor/outdoor room for higher density living. The common area could be improved with some vegetation and furniture to encourage residents to use the space.



Carpark Area from Chermshire Street⁵¹

The garden and pool area on the northern side of the Garden Block is a landscaped common area for residents. Large shade trees in the garden provide shade to visitor carparks and garden areas. The garden provides a cool and inviting entry to the Garden Block from Chermshire Street.



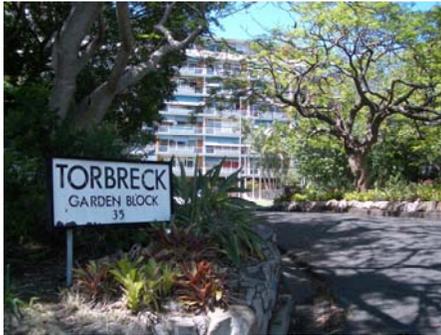
City Views to the north⁵²

The Observation Deck at the top of the Tower Block provides a common area for residents. From the Observation Deck an unobstructed 360° view of Brisbane and surrounding areas are visible. The glass façade and steel roof makes the Observation Deck extremely hot during the day.

SUBTROPICAL DESIGN MULTI-UNIT DWELLING CASE STUDY

TORBRECK HOME UNITS

5.2 VEGETATION



Torbreck entrance from Chermside Street⁵³

The original design had incorporated a roof garden at the top of the Tower Block just below the Observation Deck which would have tempered some of the radiant heat surrounding the Observation Deck.

The vegetation on site provides a transition space between the street, adjoining properties and Torbreck. The vegetation in front of the Garden Block is particularly effective in reducing the height and bulk of the building from Chermside Street.

The garden is integral to Torbreck as it provides a large shady outdoor living area for residents. Vegetation is planted on the southern side of the Garden Block to minimise soil erosion down the steep hillside.

FLORA



Vegetation on southern side of Garden Block⁵⁴

Vegetation onsite predominantly surrounds the Garden Block with large trees and shrubs on the northern and southern side of the Garden Block.



Vegetation on northern side of Garden Block⁵⁵

SUBTROPICAL DESIGN MULTI-UNIT DWELLING CASE STUDY

TORBRECK HOME UNITS

6 WATER AND WASTE MANAGEMENT

6.1 WATER TREATMENT An appraisal of the original plans and sections reveals that copper water storage tanks were originally incorporated at the top of the Tower Block at the roof garden level. The proposal included softening town water prior to distribution to the units below.

6.2 WASTE MANAGEMENT A central garbage chute system allows household wastes to be conveniently disposed and collected. It is not known how effective households within Torbreck are recycling wastes.

SUBTROPICAL DESIGN MULTI-UNIT DWELLING CASE STUDY

TORBRECK HOME UNITS

7 HUMAN FACTORS

This section describes how the residents interact with the building and each other.

7.1 PRIVACY AND ACOUSTICS

There are some visual and acoustic privacy issues in Torbreck. The location of the front door and kitchen windows of units in the Garden Block allow breezes to pass through the unit but also allow other residents to look into the units when the door and windows are open. The single skin solid brick dividing walls between units transmits sound. Without an air gap between the unit dividing walls, sound transfers directly between units.

7.2 INDOOR/OUTDOOR RELATIONSHIPS



North facing balcony in the Garden Block unit

The occupants adjust windows, doors and sunshading devices during summer to control breezes and heat gain. Windows are closed during winter to retain heat within the unit. Large glass panels allow solar access deep within the unit. The small number of air conditioning units indicates that the majority of residents adjust windows, doors and sunshading devices to suit the climate.

The larger balconies in Torbreck provide a small external space for private indoor/outdoor living. However the size of several balconies limits the types of functions that can occur in the space.

Shaded landscaped common areas near the Garden Block support larger external social gatherings. The garden is large enough for several separate groups to use the garden at the same time.

The units in Torbreck are small by contemporary standards. The living spaces are multifunctional spaces to conserve space and makes the units extremely efficient. The popularity of the Torbreck and the very low rate of turnover or vacancy suggests that the units meet the residents' contemporary lifestyle.



Landscaping and recreation area adjacent to the garden block⁵⁷

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TORBRECK HOME UNITS

8 TRANSPORT

Transport via walking, cycling and public transport is convenient as Torbreck is located close to the city, buses stop frequently along Gladstone Road and South Bank train station is within walking distance. A large lockup bicycle storage areas located in the Garden Block is available for residents and supports alternative transportation for residents. Three levels of undercover car parking reduce the impact of vehicular street parking and the carpark location reduces the visual impact from Dornoch Terrace.

SUBTROPICAL DESIGN MULTI-UNIT DWELLING CASE STUDY

TORBRECK HOME UNITS

9 SUMMARY/ LESSONS LEARNT

Torbreck is a landmark Brisbane building. The Tower Block is a visually dominant feature within Highgate Hill and is easily visible from Brisbane's CBD. Torbreck is of architectural significance as a well designed example of high rise residential building, particularly in its site planning, orientation, passive climatic strategies and detailing.

The Torbreck complex is a good example of 1950s architectural and landscape design in its form, attention to climate control and use of materials. Torbreck has aesthetic and social significance as a prominent landmark of inner suburban Brisbane and is currently heritage listed by the Queensland Government and Brisbane City Council.⁵⁸

The benefits of creating a subtropical residential development that minimises siting impact and responds appropriately to the local climatic conditions are evidenced by a 45 year old building that attracts many tenants (there is currently a waiting list). Residents enjoy living in Torbreck.

Torbreck is a good example of subtropical high density living where passive climatic strategies have been successfully implemented. The orientation and separation of the building into two separate blocks is integral to providing beneficial aspect for all units. The units provide natural light, ventilation, heating and cooling for the comfort of residents. Energy savings are made by reducing reliance on electrical appliances for internal comfort. Large shady external common areas that provide inviting usable space allow lifestyle flexibility for residents.

The building contains some construction details which are well-considered in relation to climate control and occupants' use. The balconies and verandahs have concrete planters with steel balustrades and frosted glass panels to provide both privacy and views. Metal sunshades above the Garden Block balconies and large vertical louvres to the Tower Block assist in providing passive thermal comfort.

9.1 COST BENEFITS

A well designed residential tower that positively responds to the subtropical climate reduces the need and expense of retrofitting at a later stage. The climatic success of the development can be measured by the few air conditioners that have been added. The operational energy consumption of the units is reduced due to appropriate passive design strategies that provide passive heating, cooling, ventilation and natural light.

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40 Photo by Charmaine Kai (2005)

41 Photo by Charmaine Kai (2005)

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